TECHNICAL DATA

FLIGHT

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB NOVEMBER 26th, 1942

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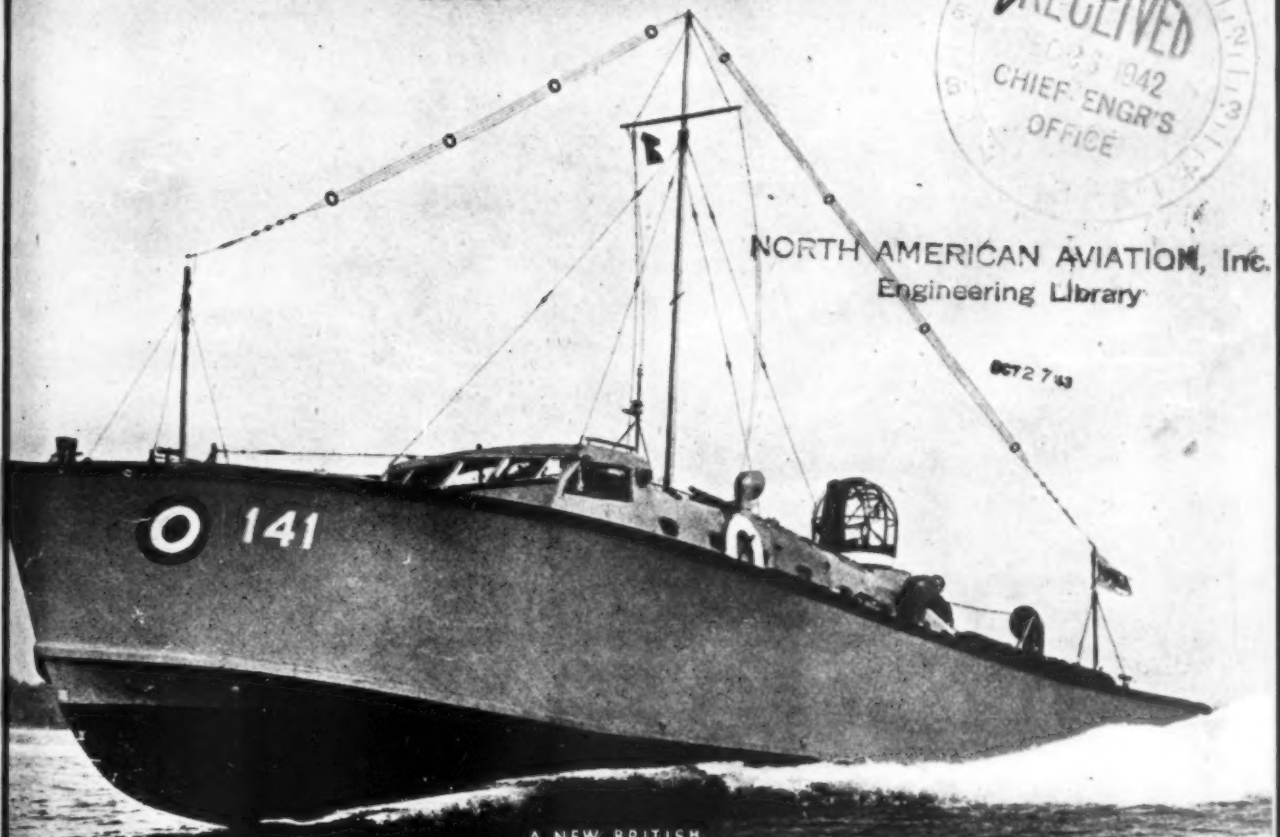

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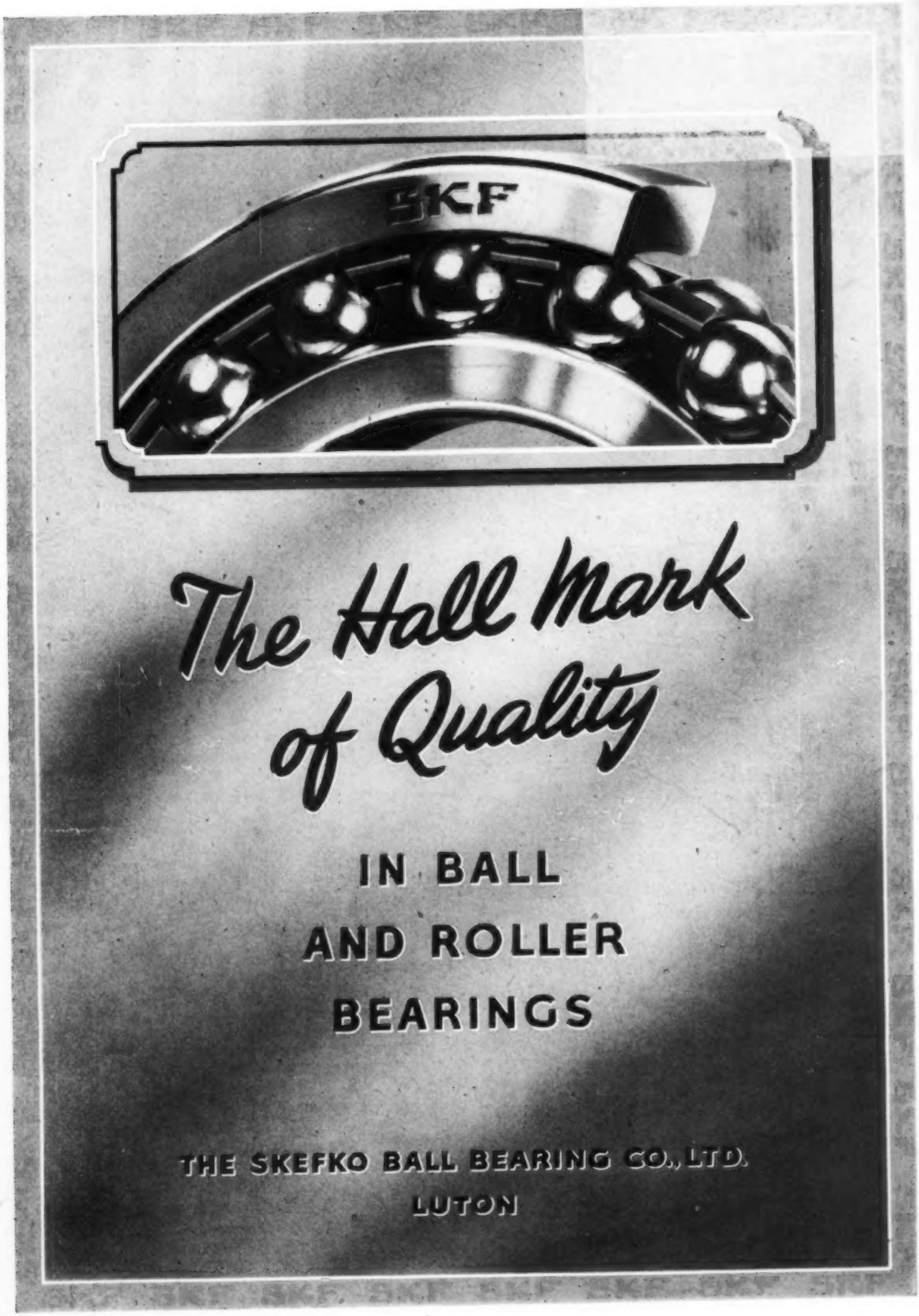
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The Outlook

Air-borne Troops Again

SINCE the German occupation of Crete the first opportunity for the use of air-borne troops on a large scale has been provided by the race for the mastery of Tunisia. The Germans and Italians are using every available aircraft capable of carrying troops and equipment to dash across the short sea crossing from Sicily, and they are even said to have sent "tanks weighing 12 tons" by air as well. If the tanks are of such a size we suggest they must have been sent in parts to be assembled on arrival. The R.A.F. raids on the airfields near Bizerta were calculated to interfere with that operation. In any case, the number sent must have been limited, while the despatch of heavy guns by air is out of the question.

The situation in Tunis is radically different from that in Crete because the United Nations are attacking by land, and therefore every description of weapon, heavy as well as light, can be brought up to the battlefield, though not all with equal speed. The advance guard of the British First Army would naturally consist of the fastest, and therefore the lightest, elements, but the heavy stuff which in the long run ensures victory followed on, and to that the Axis, lacking command of the sea, could make no reply.

Speed was essential in this race for possession, not because ultimate Allied success was in doubt, but to save all the trouble and casualties which would be necessary if the Axis could put up even a moderately strong resistance. That made out a clear case for the employment of air-borne troops by the Allies, and strong forces of parachutists were sent on ahead of the motorised and mechanised forces which have raced along the roads from the port of Bougie. American aircraft were used to carry British parties, another example of the unprecedented co-operation between the two nations engaged in this enterprise. These Allied parachute troops were in a much stronger tactical position than the air-borne troops of the Axis, for the former knew that a whole well-equipped army was dashing up to their support, and that they themselves had to fight only as a super-advanced guard. They, in fact, represented a legitimate tactical use of air-borne troops, whereas those landed by the Axis were in the nature of a forlorn hope.

The U.S. Naval Victory

IT may be some time before the despatches of Vice-Admiral Halsey on the great naval battle off the Solomons are published, but one striking feature emerges from the preliminary reports, namely, that the Japanese seem to have had no aircraft carriers present. They had battleships, as they have had them in previous engagements in the Pacific, and this time the Americans had battleships present also. Probably they were able to use land-based aircraft during the battle, and the Japanese may have tried to do so, too. Admiral Nimitz, the Commander-in-Chief of the Pacific Fleet, who has his headquarters at Pearl Harbour, has mentioned that the "apparent absence of Japanese aircraft-carriers" was a contributory cause of the American victory.

When the Japanese entered the war they started by making a bold and successful use of their carriers, but since then their casualties in that class of ship have been very heavy. Quite recently it was reported from New Guinea that they had sent practically all their aircraft from there to the Solomons, which suggests a shortage of carriers, and, in consequence, the Australians and Americans in Papua have since had a pronounced superiority in the air, and have used it to good effect.

Nobody now doubts the importance of carriers, especially in the Pacific, but Admiral Nimitz declares that the Solomons battle has justified the American Navy's faith

in battleships. Recently the United States decided to divert shipbuilding energies from battleships to carriers, but those who concluded therefrom that the day of the battleship is over were at least premature. The U.S. Navy wanted more carriers rather than more battleships, but carriers need a backing of heavy fighting ships. When two well-balanced fleets engage each other, it is battleships which decide the day, and it is battleships (with their necessary auxiliaries) which will ultimately win the war against Japan.

Sir Stafford Cripps at M.A.P.

THE ordinary taxpayers, and particularly the staff and readers of *Flight*, may be pardoned if they feel thoroughly bewildered at the frequent changes of Minister of Aircraft Production. The latest change, namely, the substitution of Sir Stafford Cripps for Col. Llewellin, is the most surprising of all.

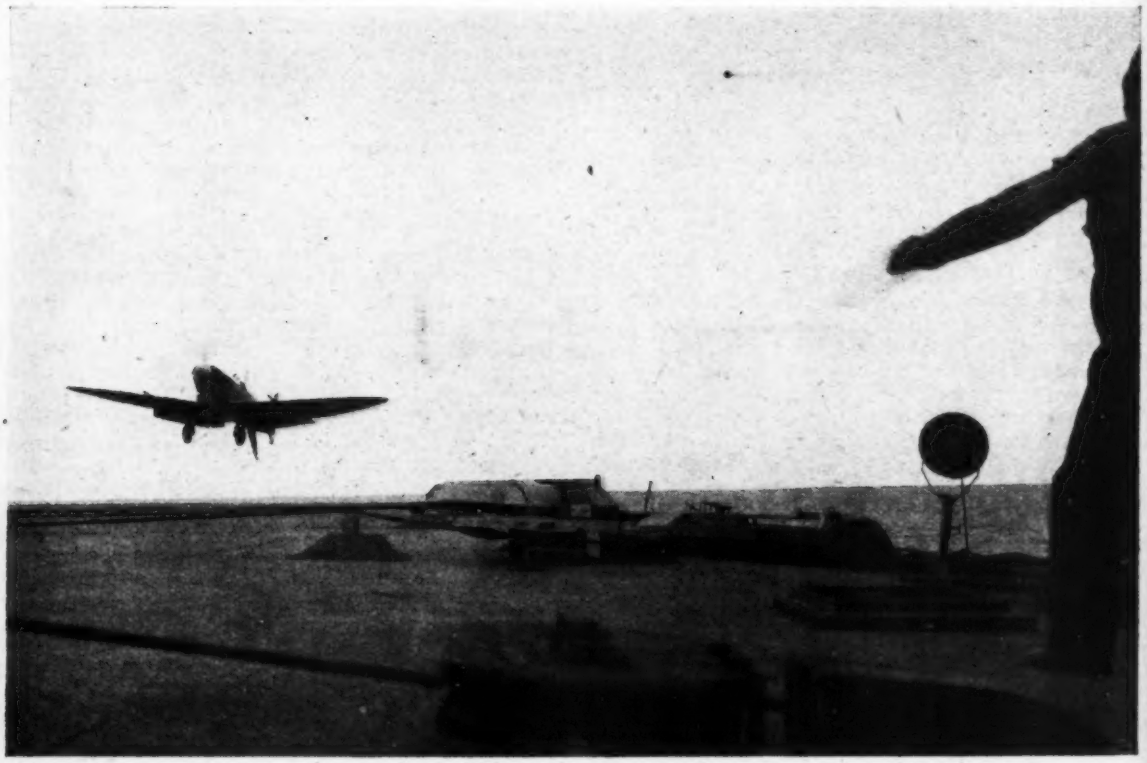
Sir Stafford Cripps is an eminent and successful King's Counsel, and he is undoubtedly a very clever man, but he has had in the course of his career very little experience of administration. In the last war he was for a period in 1915 Assistant Superintendent of H.M. Factory at Queen's Ferry, and that is the sum total of his experience in that direction. It hardly suggests that he is the one man above all others to get results in aircraft production on a scale surpassing all his numerous predecessors.

The Prime Minister, in offering the post to Sir Stafford, wrote that the proposal was conceived solely to meet a most serious war need. That may be Mr. Churchill's way of gilding the pill, for he has admittedly "stepped Sir Stafford down in the political hierarchy," but it implies a reflection on his immediate predecessors. Mr. Churchill also wrote that this new work would bring him and Sir Stafford "more closely together even than heretofore," because Mr. Churchill is Minister of Defence. The implication seems to be that Mr. Churchill intends to supervise the general policy of the Ministry of Aircraft Production himself, presumably in deciding such matters as whether chief insistence should be laid on the massive bombing of German production, or on air support for land armies, or some other strategic object. The planning of production at the Ministry of Aircraft Production is always intimately tied up with British major strategy in this war.

Frequent changes of the Minister in charge of this very important Ministry must be a bad thing, and have a very unsettling effect on those who work for it.

CONTENTS

The Outlook	567
War in the Air	569
Here and There	572
Catapult Training	573
Correspondence	577
Behind the Lines	578
Aircraft Characteristics	578, a and b
Fighter Armament—Part III	579
In Parliament	585
Hydulignum	586
Air Transport of the Future	588
Service Aviation	591



NAVAL FIGHTER : In August last the Germans reported Spitfires being used to protect our convoys to Russia. These deck-landing Spitfires are known as Seafires and have a hook to pick up the arrester wires on the carriers' decks. The Seafire shown landing here has a tropicalised air intake and a long-range tank. The armament is two 20 mm. Hispano cannons and four .303 in. Brownings but other Seafires can carry four cannons. Another photograph appears on page 571.

War in the Air

IN THE LIGHT OF DAY: A striking picture of a night-camouflaged Lancaster on test.

Italian Centres Bombed : U-boat Nests Harried : Japanese Pounded on Land and Sea : Aircraft's Role in Africa

THE sudden development of the Mediterranean campaign brought some respite to the Ruhr and other industrial parts of Germany. First of all, the R.A.F., together with the U.S. Army Air Corps, had to guard the huge convoys as they made their way through the dangerous waters of the Bay of Biscay towards the coast of Africa. This was in the main a task for Coastal Command, but it was reinforced by numbers of squadrons from Bomber Command, and Air Chief Marshal Sir Philip Joubert received much assistance from Air Vice-Marshal J. M. Robb, the Deputy Chief of Combined Operations. Secrecy was maintained to the pitch of not even telling the commanding officers of the air squadrons what was afoot. The air over the Bay was full of British and U.S. aircraft of all classes which had the necessary range while the hundreds of ships made their way southwards. The flying boats and bombers kept the U-boats submerged, while Beaufighters held off the enemy aircraft.

However, the U-boats were naturally persistent, and after the ships left Gibraltar the under-water craft converged. This move of theirs, however, meant more targets for our aircraft, and three of them were attacked in just over an hour by Hudsons of Coastal Command, which must have taken off from the Rock. On the next day Catalinas and Hudsons kept up the escort, and then naval Swordfish also took a hand. Four U-boats were attacked that day in the Mediterranean, and at least one was sunk by a bomb. What losses the Germans succeeded in inflicting has naturally not been made public as yet, but obviously they made no material difference to the success of the expedition.

Naturally there followed a series of attacks by heavy bombers on various places, all the raids being obviously connected with the plan of helping the Anglo-American expeditionary forces in Africa. Notable targets were Genoa, Turin, and the most notorious U-boat bases. The Eighth American Army Air Force sent its Fortresses and Liberators on a series of dusk raids against these bases at St. Nazaire, Lorient, and La Pallice. Fighter Command supplied escorts to the nearer places, but very little opposition was met with, and the raiders and escorts returned safely from St. Nazaire, while on the day when the other two raids took place only one American bomber was lost.

Genoa, the main port of embarkation for reinforcements and supplies to Africa, was subjected to a whole series of heavy night raids by Bomber Command. The first one took the defence by surprise, but afterwards the number of guns and searchlights round the place was increased. This had little effect, for the experienced bomber crews evaded the beams and the gunfire, and usually succeeded in squelching the defences. Perhaps the crews

THEREBY HANGS A TAIL: The rudder of a U.S. Army Fortress as it arrived back after a daylight raid over France.

WAR IN THE AIR

on the ground, presumably Italians for the most part, did not stick to their guns with any great determination. The harbour was the main target, but many very heavy bombs were also dropped on the Ansaldo armament works. On a surprising number of occasions the whole of the raiding force returned to England without having lost a single machine.

The effect on the population of Genoa can be gauged from the report that the Italian removal agencies have been charging exorbitant prices for moving furniture and goods out of Genoa. Price control in Italy is evidently not yet very effective.

The Race in Africa

THE British and American parachute troops which landed in Tunisia wasted no time in seizing a very important airfield, and some of them also advanced. The British and American forces advanced in two columns, one (the British First Army) pressing along the coast towards the all-important naval base of Bizerta and its adjacent airfield, while the other moved into the south of the Protectorate with the obvious intention of closing the door behind Rommel's fleeing remnants. The position is confused at the moment of writing, but may shortly be elucidated.

Axis aircraft made a low-level attack on the ports of Bône and Bougie, which are in British hands, and did some not very serious damage to shipping in the harbour, but they lost heavily in the process.

An interesting detail has been made known about the American landings in Morocco. A French mechanised column from Marrakesh advanced against them, and was tackled by American dive-bombers. There are occasions when that class of aircraft can be usefully employed, but ships are its most profitable targets. The British view is that low-flying bombers are more useful on the battlefield. Rommel's Stukas did not play a glorious part in the Battle of Egypt.

As General Montgomery's Eighth Army approached Benghazi, the rôle of his aircraft was altered once again to some extent. Some squadrons continued the work of smashing up the retreating transport of the enemy, but that became a secondary object; the remainder devoted their energies to stopping reinforcements or supplies from reaching Rommel's men. It is believed that some reinforcements had already reached him, but, so far as air transport is concerned, the Axis transport machines have had to divide their duties between Rommel and Tunisia, with the latter taking priority place. The losses of these transports from the attacks of our fighters and from ground-strafing have been very heavy. The "Sudan Squadron" scored its hundredth victory when it caught a number of these transports about to land on Benina airfield, near Benghazi. They shot down no fewer than seven Ju 52s as the latter were circling the landing ground and smashed up four more on the ground. Some were evidently loaded with petrol drums. Naval aircraft sank a large tanker sailing towards Tripoli one day recently. But it is impossible to keep pace with all the details of losses inflicted on the Axis by Allied aircraft.

OVER THE STERN: A Grumman Martlet coming in to land over the round-down of H.M.S. *Victorious*. Of particular interest is the way in which the arrester gear hook hangs from the tail.

"Flight" photograph

An "improved" Spitfire in the hands of a Polish pilot. It has just taken off and the wheels are nearly retracted. There is an auxiliary petrol tank under the centre section, and the blanks by the side of the cannons indicate where two further cannons can be mounted if required.

The Pacific War

IT is clear by now that Japan no longer rules either the waves or the air in the Pacific. We do not yet know very much about the American naval victory off the Solomons, but American battleships were engaged and proved their might. The Japanese seem to have had no aircraft carriers in the battle, or at least they escaped the notice of the American Admiral.

In the meantime, the Australians and Americans have evidently established air superiority, if not supremacy, in New Guinea. General MacArthur has gone to that theatre to take command in person, and American troops have been landed on the north shore of Papua. As the Australians fought their way downhill from the Owen Stanley range towards the Japanese base of Buna, the enemy was constantly pounded by Beaufighters, Havocs and North American bombers, to mention but a few of

WAR IN THE AIR

ENEMY AIR LOSSES TO NOV. 21st

	Over G.B.	Over Continent	Middle East
Nov. 15	0	0	2
,, 16	0	7	1
,, 17	0	0	6
,, 18	0	0	8
,, 19	0	2	3
,, 20	0	0	2
,, 21	0	0	2
	0	9	24
	—	—	dest'd in air combat

Totals: West, 6,483; Middle East and French Africa, over 5,024.

the types engaged. It was an occasion on which medium class bombers and long-range twin-engined fighters were the appropriate class of aircraft for harassing the enemy with the utmost effect. The heavy Fortresses and Liberators are kept for such work as bombing elaborate harbour works and large warships. Very little air resistance was encountered.

Burma belongs to the Indian Ocean, not to the Pacific area, but the two are linked together because the enemy in both is Japan. Both the R.A.F. and the Americans in India have been bombing the airfields and ports which the Japanese have occupied. At Akyab there was strong resistance from the enemy fighters, but the raiders suffered little loss. On November 20th the 10th American Army Air Force sent out the largest formation of heavy bombers which had yet operated from India against the railway centre of Mandalay. The R.A.F. was also busy with medium bombers and Blenheims, which are now reckoned as light bombers. Much damage was done, and not one Allied machine was lost in the whole series of raids. The cold weather (one does not speak of "winter" in India and Burma) has now well set in, and naturally expectations have been aroused that soon an attempt would be made to reconquer Burma and so open the road to China. General Wavell is not the man to delay an attack without good reason, and so we must wait in patience until he feels himself in a position to begin an offensive.

SHOW A LEG: Reveille at a Russian air training school. From the time shown on the clock they evidently believe in an early start.

BRITISH & U.S. AIR LOSSES TO NOV. 21st

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Nov. 15	0	0	0	5
,, 16	0	0	0	1
,, 17	0	0	0	0
,, 18	0	0	3	6
,, 19	0	0	2	0
,, 20	0	6	1	1
,, 21	0	0	0	0
	0	6	6	13

Totals: West, 4,860; Middle East and French Africa, about 1,942.

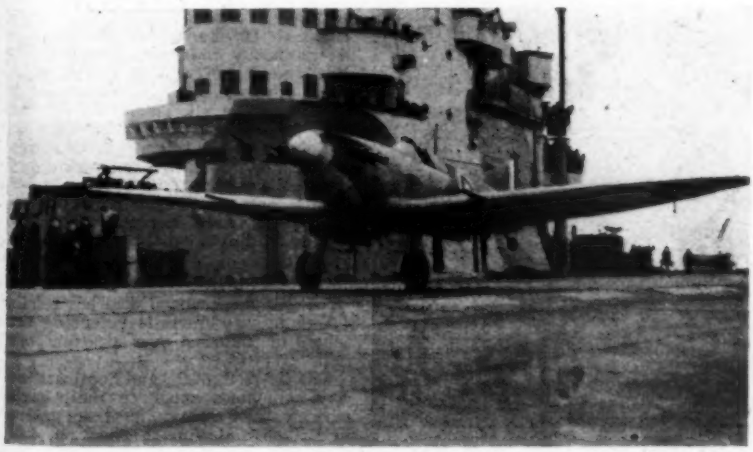
Later News

ALL the United Nations rejoice at the great victory which the Russians have won in the Caucasus, but the part played in it by air forces has not been mentioned.

In Italy, Turin succeeded Genoa as the objective of Bomber Command, and an extremely heavy raid was made on the night of November 20th, perhaps at the same time as the Americans were striking at Mandalay. The Turin raid was another concentrated affair, lasting one hour, and something short of 100 two-ton bombs were dropped on the Royal Arsenal, the Fiat works, and the Caproni works. Many large fires were started, and one column of smoke rose to the amazing height of 8,000ft. Only three of our bombers did not return. Mr Churchill's promise that Italy would be bombed in increasing measure is being made good. Italian *moral* is certainly less stubborn than that of the Germans, and many of the people hate the war. Its unpopularity must now be growing apace.

In North Africa the news as we go to press is that heavy bombers are reaching out at the Axis troops from both east and west. Some from the Eighth Army have bombed Tripoli in daylight, the first time for many months that this has been done. From the western area American Fortresses of the 12th Air Force, escorted by Lockheed Lightnings (the first time they have been in action outside the Pacific zone), have made another attack on the Tunis airfield, where they damaged Axis machines on the ground, and also hit hangars and warehouses. German fighters went up against them, and paid for their rashness with the loss of four.

Correspondents have begun to discuss whether Rommel will try to make a stand at his previous strong position at El Agheila, or whether he will make an attempt to evacuate the remnants of his forces from Tripoli. Our bombers would have something to say to the latter move.



THE SEAFIRE: One of the latest naval fighters passing the "island" as it takes off from one of our carriers. This Seafire differs slightly from the one shown on page 568 in that it has a standard air intake and no long-range tank. The armament is the same.

HERE AND THERE

Cork Airport Site

THE Eire Parliamentary Secretary to the Minister for Finance, Mr. Hugo Flinn, told the Cork Chamber of Commerce recently that before spending £100,000 on the construction of the proposed municipal airdrome for Cork at Middleton it was decided to have a further survey made in the area.

Airgraphs for Eire?

THE question of using the British airgraph service for postal communications from Eire is being discussed with the British postal authorities, according to an announcement made by the Eire Minister for Posts and Telegraphs (Mr. P. J. Little) in reply to a question in the Dail in Dublin recently.

Fighters First

AIR CHIEF MARSHAL SIR ARTHUR TEDDER, A.O.C.-in-C., Allied Air Forces, Middle East, left no doubt about his opinion on the relative value of fighter and bomber aircraft, when he spoke at a Press conference in Cairo recently.

"Fighters," he said, "are the key to air superiority. Fighters without bombers can at least play a defensive rôle, but bombers without fighters are useless."

Tales Told by Ears

ALEXANDER KLEMIN recently described in *The Scientific American* a new device called the "Oximeter," which measures the efficiency of a pilot in the thin air at high altitudes by recording the oxygen saturation in his blood. The symptoms and results of insufficient oxygen are set forth and an explanation is given of the superior results obtained by the use of the new instrument compared with previously existing methods.

The instrument functions through the change of colour of blood as the oxygen content changes, thus permitting accurate measurement by means of a photocell and a galvanometer. Connected to the pilot's ear, the instrument reveals the condition of the blood stream.

A NEW SLANT ON AN OLD TAIL: The Beaufighter now wears its tailplane at the fashionable (dihedral) angle, largely popularised by our American friends. Greater steadiness during take-off is the practical aspect of it.

Fleet Air Arm Age Limit

THE Board of Admiralty has decided to raise the upper age limit for applicants from civil life for entry into the Fleet Air Arm as pilots, observers and air-gunners.

This will now be 30 instead of 28 as hitherto, and application should in the first place be made at combined recruiting centres.

Selected candidates of a type suitable for temporary naval commissions will be given courses lasting six months at universities where naval divisions have been formed, namely, Oxford, Cambridge, Liverpool, Cardiff, Edinburgh and Glasgow.

Candidates for this new scheme must be nominated by the headmaster of their present, or last, school, and must be between the ages of 17½ and 18½; nominations should be forwarded to the Officer-in-Charge of the nearest Naval Centre.

Full particulars may be obtained from any Naval Centre, or from the Director of Pre-entry Training, The Admiralty, Rex House, London, S.W.1.

Allied Scientists to Meet

PROMINENT scientists from more than 15 countries will speak at a conference to be held on December 5th and 6th by the Association of Scientific Workers, at 1, Grosvenor Place, London, S.W.1.

Sir Richard Gregory, F.R.S. (president of the British Association for the Advancement of Science), Sir John Russel, F.R.S., and Prof. John Marrack, D.S.O., M.C., will preside at the three sessions; the subject is to be "Scientists of the United Nations and the War Effort."

Death of Mr. Dagnall

WE record with great regret the death, on November 16th, of Mr. R. F. Dagnall, managing director of the R.F.D. Company, Ltd. Reginald Foster Dagnall was born in London in 1888 and educated at Tiffins School, Kingston-on-Thames. He started his career in one of the heavy industries, being in the drawing office of the Thames Iron Works until 1910. Then he joined E. T. Willows in small airship work; and during the 1914-18 war he was first works manager and then general manager of Airships, Ltd., a firm which made kite balloons and "Blimps." In 1920 Mr. Dagnall founded his own company, which has since become famous for pneumatic dinghies and barrage balloons.

Peaceful Penetration

A RECENT financial deal has resulted in railway interests extending their sphere of influence over air transportation.

The G.W., L.M.S., and Southern Railway companies announce that, having recently been offered the major interest in British and Foreign Aviation, Ltd., they have "acquired these shares."

This means that a number of air services, including West Coast Airways, Isle of Man Air Services and Olley Air Services, are now owned by the railway combine, and are under its control.

ON THE JOB: Air Chief Marshal Sir Arthur Tedder, A.O.C.-in-C. Middle East, whose opinion on the vital part played by fighter aircraft is quoted above, photographed during a visit to a long-range fighter squadron in the Western Desert. To the right of him are Wing Cdr. Bragg, commanding the squadron, and A. V-M. L. H. Slatter, who accompanied Sir Arthur. They are examining photographs taken during operations.

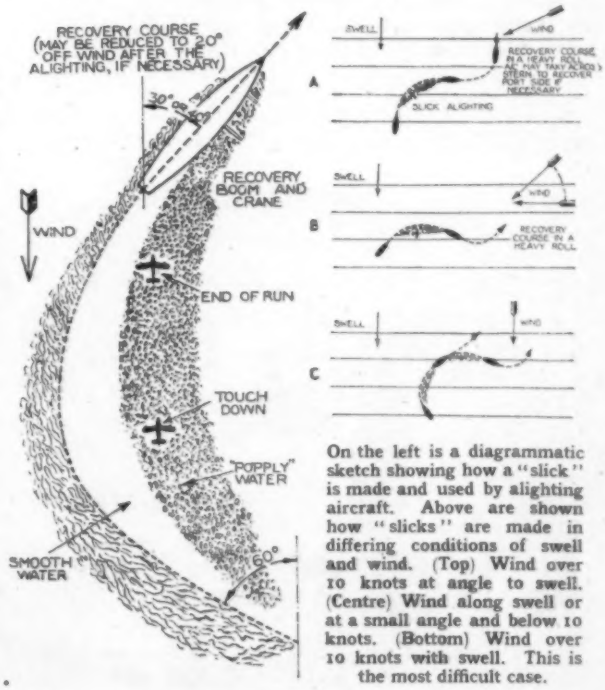
Catapult Training

Five-day Course for Pilots, Aircrews and Catapult Operators : Making a "Slick" Landing on Rough Water

A Vickers-Supermarine Walrus amphibian leaving the 90ft. cordite-operated catapult of H.M.S. *Pegasus*. The trolley, which supports the Walrus at four points, can be seen to have folded forward at the end of its travel.

ON H.M.S. *Pegasus*—originally designed as an oil tanker rejoicing in the now famous name of *Ark Royal*, the second ship to hold this name—pilots, aircrews, directing officers, aircraft personnel, handling parties, torpedo officers, electrical artificers, crane operators, catapult officers, catapult E.R.A.s and breech workers all attend a course, each to learn his share of the process of launching seaplanes and flying boats by catapult, and recovering them after landing. Where possible, all the affected personnel of a ship being newly commissioned attend the course together in order that they may become more of a trained team than a number of trained individuals.

Before describing the syllabus of work done on the course, perhaps it would be as well to visualise a typical launch and recovery of a Walrus amphibian. The catapult is extended to its full 90ft. and the Walrus, already on the trolley, is traversed out to the back end. A shell case containing between 12-30 lb. (according to all-up weight of aircraft) of cordite is put into the breech and fired at the dropping of a flag by the directing officer. This signal is given as the ship begins to come up from any rolling motion it might have. There is a time lag of from one to one and a half seconds before the gases from the exploded cordite begin to take effect. The trolley carrying the



On the left is a diagrammatic sketch showing how a "slick" is made and used by alighting aircraft. Above are shown how "slicks" are made in differing conditions of swell and wind. (Top) Wind over 10 knots at angle to swell. (Centre) Wind along swell or at a small angle and below 10 knots. (Bottom) Wind over 10 knots with swell. This is the most difficult case.

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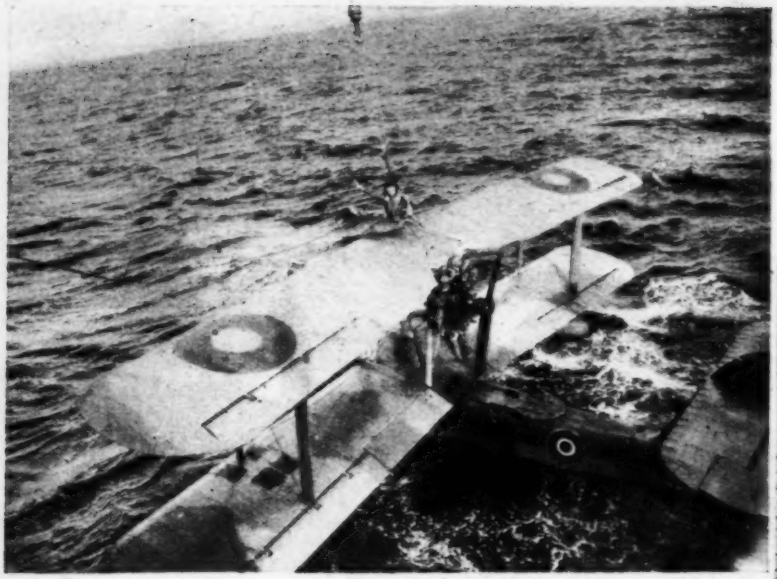
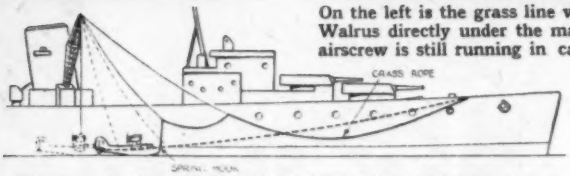
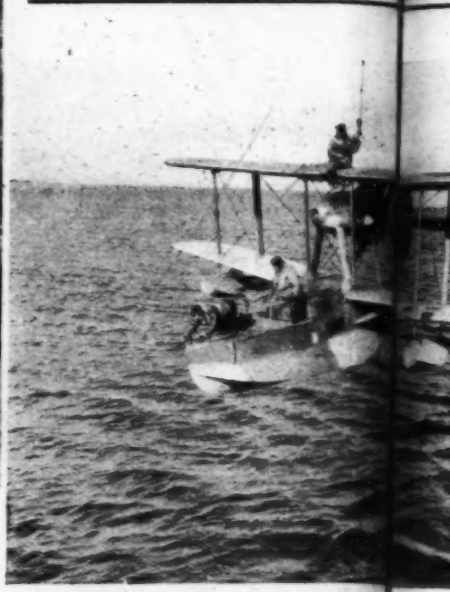


On the left is the grass line which holds the Walrus directly under the main hoist. The airscrew is still running in case of mishap.



The layout of the grass (floating) towing line and the main hoisting gear in relation to the ship and flying boat. For a tractor seaplane the towing line terminates in a floating net.

CATAPUL RAI



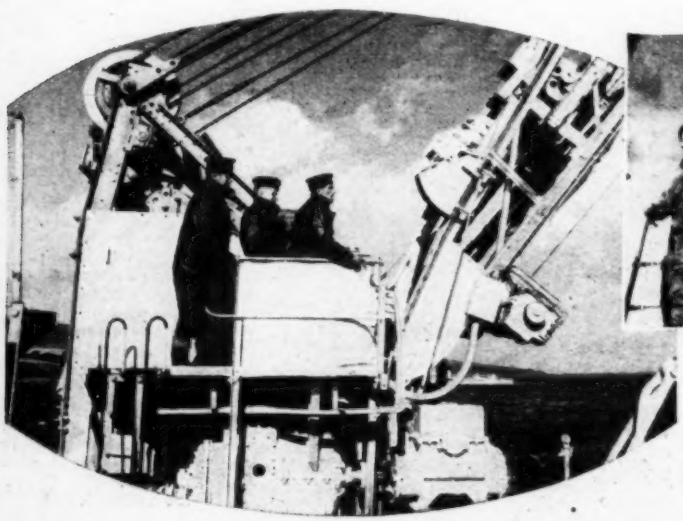
Clear of the water, with the airscrew stopped, the Walrus is hoisted inboard. The towing rope is being cast off.

Walrus reaches its maximum speed, about 55 knots, after travelling 61ft. along the catapult. This speed is maintained for a further 10ft., and while running the remaining 19ft. it decelerates before coming to rest at the end of its run. As the braking effect comes into play the Walrus over-runs the trolley—which collapses forward—and the amphibian is then airborne.

A ship's catapult can be fired in any direction provided the wind is not abaft the beam of the aircraft. The aircraft can be launched in still air or even in a strong side wind. The aircrew find their first catapultings quite exciting because there is always a tendency to hold oneself over-rigid during the acceleration. After a few attempts, however, they rest their heads against the special pads provided and relax. A misfire is very unpleasant. The signal flag goes down and the usual time lag passes. Split seconds then seem like hours until a signal shows that it is safe to take the head from the rest.

When the Walrus is ready to alight, the ship makes a "slick" of calm water on the leeside, and in this area

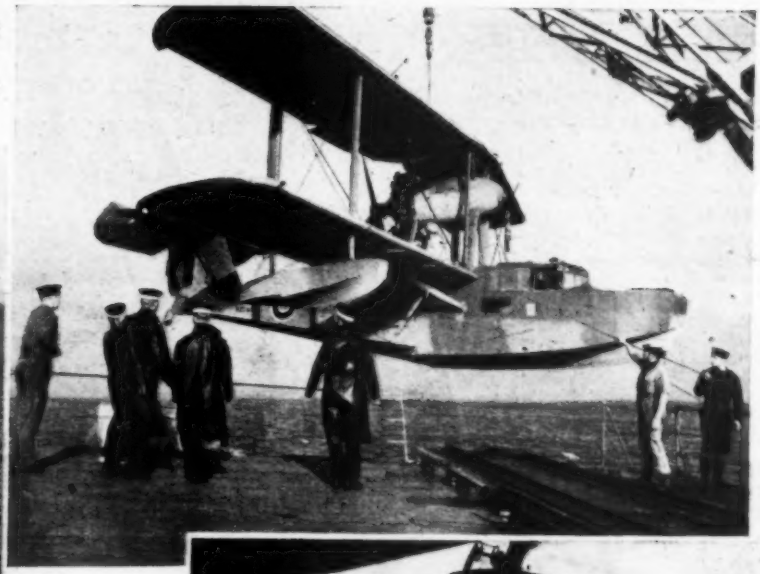
(Bottom Centre) Instruction in "Thomas Grab." The light lower half can be lowered independently for a further 16ft. This is to avoid damage to the aircraft by the heavy weight of the Ponder Ball.



(Above) Acting Leading Airmen waiting for their turn to fly. A number of rating pilots also attend the course.

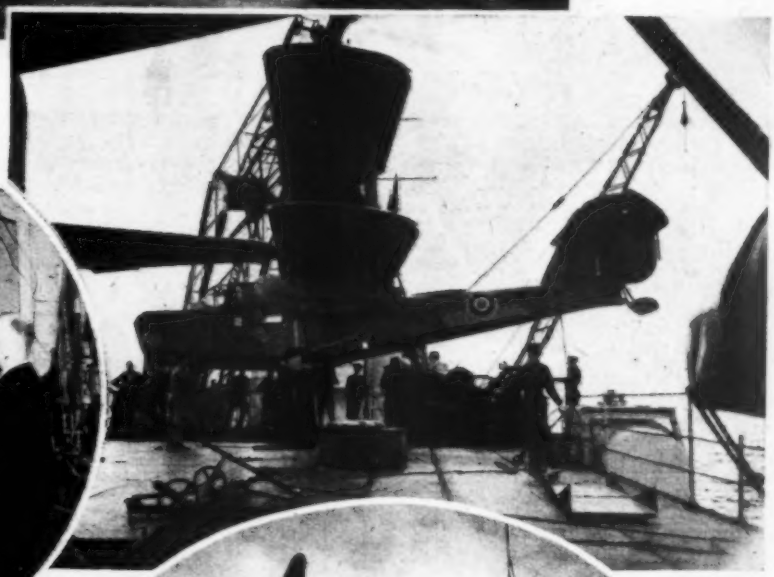
(Left) Instruction in crane control. The operation is so complicated that there should be always at least two men at the controls.

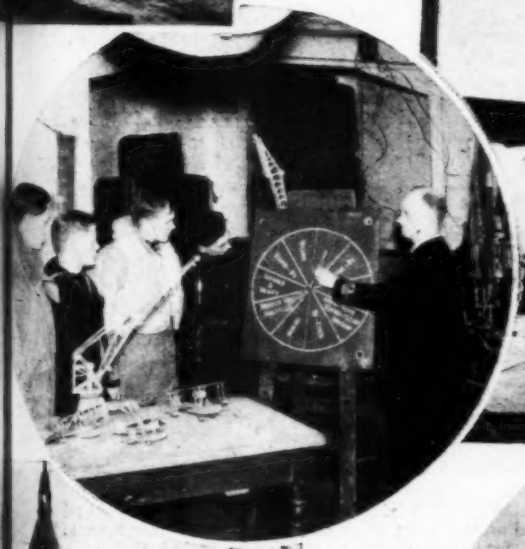
PUL RAINING

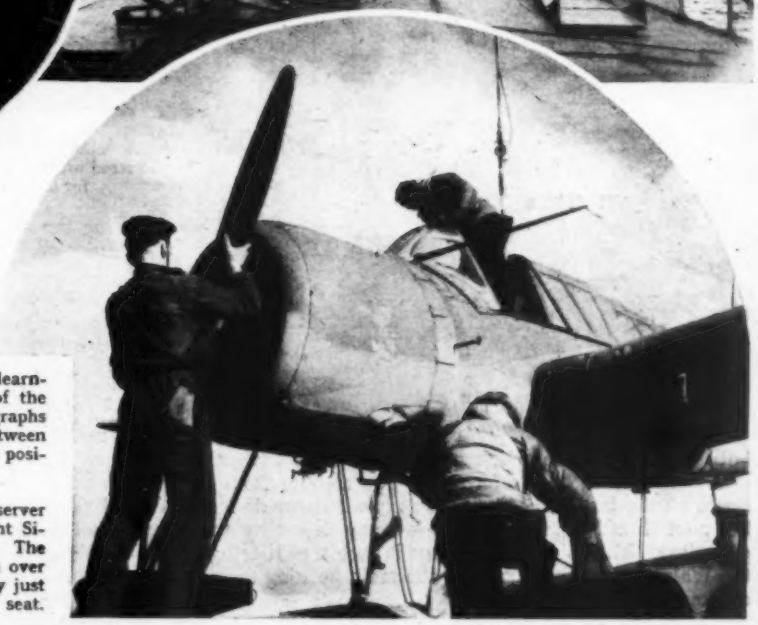


(Left) The Walrus being handled inboard over the catapult, which can be seen on the deck in the right foreground.

(Below) Putting the Walrus back on the catapult trolley. The land undercarriage is let down and the wheels locked to give the handling party a good grip.







(In circle) Trainees learning the operation of the special ship telegraphs used to signal between the catapult control position.

(Right) Pilot and observer get aboard a Vought Sikorsky Kingfisher. The crane attachment is over the centre of gravity just behind the pilot's seat.

CATAPULT TRAINING

of artificial calm the Walrus comes in at 60 knots to land from 6ft. in a powered stall. On the face of it this appears to be a brutal manner in which to land, but actually it has been found by experience to be much more satisfactory than a normal tail-up "seaplane" landing. The essential factor is to get the heel of the hull (or floats in the case of a seaplane) into the water first. Having landed, the pilot taxies alongside the ship

(Below) Back on the catapult deck of H.M.S. *Pegasus*. Beaching gear is fitted to the Kingfisher to facilitate handling.

(Below) This view of the Kingfisher being hoisted out gives a clear picture of the central float arrangement.

The Kingfisher on the water and engine started, the observer disconnects the hoist and slides back to his own cockpit.

(Above) All set. A Kingfisher about to be swung out and lowered on to the water by crane. The trolley attachments for catapulting are on the single central float.

until the observer can pick up the spring hook which is attached to the end of a grass line coming from a boom on the forecastle. When this has been made fast the pilot throttles back until he is being towed by the grass line. The length of this rope is such that it brings the Walrus directly underneath the main hoisting tackle of the crane.

During the time the tow-line is being made fast, the air gunner climbs on to the top plane and is ready to attach the hoisting gear as it appears overhead. This system has been devised for pusher flying-boats, but, quite obviously, nobody in a tractor seaplane could go forward to make fast the tow-line because the airscrew is never stopped until an aircraft—of whatever type—is clear of the water. To meet this need on seaplanes, a hook is fitted to the bottom of the floats and the floating grass line terminates in a semi-submerged net. The seaplane over-runs the net, and when it drifts back the hook catches in the net. The remainder of the procedure is the same. The aircraft is finally lifted inboard and loaded on to the catapult trolley or stowed in the hangar.

On the training course, the first day starts with all officers and ratings attending lectures on cranes and other recovery gear. During these lectures, model aircraft

CATAPULT TRAINING

and cranes are used for demonstration. The different types of catapults and their superstructures are described in addition to notes on the amphibian loading gear. Later in the day practical work is done on the crane itself, and naval aircraft personnel have specialised instruction on administration and securing gear.

For the second day's work, directing officers (responsible for firing the catapult) torpedo officers (responsible for the crane), aircrews, petty officers of handling party, naval aircraft personnel, and electrical artificers attend further lectures. This time they deal with the "loading" and "off-loading" of the aircraft on the catapult and recovery of aircraft under all conditions, including night operation. On the same day, practical instruction is given to crane operators and crane electrical artificers, and also to breech workers. The breech worker is, of course, the man who puts the operating charge of cordite into the catapult breech and fires it when instructed.

A combination of theory and practice goes to make up the third day's instruction. All officers and ratings attend lectures on catapult launching, catapult drill and communication. An instructional 35 mm. sound film is shown, and then the trainees practise towed recoveries and loading on and off the catapult with a Vickers Walrus amphibian. Apart from the loading and off-loading, this exercise familiarises the various crews with the use of the specialised crane tackle used to ensure both safety and speed in operation. For this instruction, the Walrus is not catapulted but lowered over the side and towed by a line from a boom on the forecastle.

Theoretical work and simple operations having been completed, the fourth and fifth days are devoted to flying as if on service. All officers and ratings attend, and the programme includes catapult launchings; "slick" landings; rough-weather handling; use of securing gear; recoveries of aircraft by towed and direct methods; with ship under way and also at anchor; slipping Walrus from crane; night launching and recovery.

At the end of these five days' intensive training, everyone knows his job pretty thoroughly.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FAULTY FILMS

Repeated Use of a Familiar "Shot"

I NOTE with sympathy the reactions of your correspondents to the large number of technical howlers in aeronautical films.

My own protest concerns the repeated showing of a shot in which the same unfortunate German aircraft meets its doom. The incident appears to date from the Battle of Britain. No doubt readers of *Flight* are familiar with the scene—the German, presumably a Heinkel 111, is shown from astern through the sights of a fighter; after a few seconds it is subjected to a violent explosion which reduces it to a cloud of dust.

This Heinkel has been met in countless films, including various M. of I. and similar productions, and, while admitting the entertainment value of such a spectacle, I feel that others, like myself, are growing a trifle weary. ROY T. SMITH.

Studios Working Under Difficulties

IN his letter of November 12th, your correspondent, S. W. Greenwood, brought up the subject of accuracy in aeronautical films.

This is a subject in which I happen to be very interested, for having a film-star sister, I have visited Denham studios several times, and was present on the set during some of the shooting of "The First of the Few."

In this film (and I say this with first-hand knowledge) a great deal of trouble was gone to to ensure accuracy, but it was definitely a case of not quite enough trouble, i.e., cockpit covers and ejector exhausts which Mr. Greenwood mentions.

I would like to stress, however, that British film studios are finding the bugbear of security measures and lack of labour and materials very trying.

Taking all this into account and allowing for a considerable amount of mistakes which I will not attempt to deny, I really think that Mr. Howard's film was a very courageous effort for such a detailed subject.

For the benefit of Messrs. Fisher and Greenwood, I prescribe the films "Captains of the Clouds" and "Eagle Squadron" as examples of what can be done out of the immediate war zone.

It may interest readers to know that Mr. Michael Powell, director of "49th Parallel" and "One of Our Aircraft is Missing," may be going to make a film of the Hurricanes in Russia shortly, under the technical advice of Wing Cdr. Ramsbottom-Isherwood, commander of the expedition.

E. C. KERR-TRIMMER.

TRANSATLANTIC AIR MAIL

Exporters in a Difficulty

IN your issue of October 29th, page 464, you referred to the overburdening of the transatlantic air mail service and the fact that some mails in such instances would be sent by sea.

We, as exporters throughout the world, were very concerned in this bit of news, as we send very important documents by transatlantic air mail with copies by sea mail, as we cannot run the risk of having them lost, thereby causing considerable delay to us in receiving our payments, and to our customers in claiming their goods. We are also caused considerable expense and inconvenience in obtaining duplicate sets if originals should not arrive.

We therefore took this matter up with the Post Office, and we were advised by them that they could make no suggestion how we could overcome this difficulty; in fact they went so far as to reply to our suggestion that we might mark certain envelopes which contained these important documents "By transatlantic air service only, not by surface route," that even if we did this there could be no guarantee that these letters would be carried by air, as they would be mixed up in postal bags containing other types of mail, and it would be too late to sort these out after decision had been made to leave some of the mail behind because the load was too much for the aircraft available.

The point now arises as to whether there are other exporters in a similar position to ourselves, and we feel sure there must be, with whom we might come to some agreement and possibly also with the Post Office, whereby a bag could be made up comprising only such important letters, clearly marked, so that if any mail had to be excluded at the last moment the Post Office could ensure that bags so marked could at any rate be put on board without fail.

With this view in mind, we are asking you to co-operate with us if possible, and to put us in touch with other exporters or other concerns interested, so that if there are a sufficient number of us we can act together for our own security, and to facilitate the Post Office arrangements. R. N. DIXON.

Rabone, Petersen & Co., Ltd.

Back Numbers Wanted

READERS fortunate enough to have back numbers of *Flight* for which they have no further use are asked to send to this office the following copies for fellow-readers:—

R. G. B.: August 28th, September 11th, 1941, and April 30th, 1942. O. R. O.: July 11th, 18th, 25th, August 8th, 15th, October 24th, 1940. L.W.: September 17th and 24th, 1942.

BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Cheese for Morale

IT is now reported from Germany that, following the R.A.F. raid on Munich on September 19th, the population of the town were awarded a special consolation prize by the Gauleiter of Bavaria: an extra ration of 2.2oz. of cheese was distributed to all inhabitants of Munich between September 22nd and October 3rd.

Since the practice of distribution of extra food rations for a short spell of time following a raid is reported from other German towns, it can be concluded that this is thought by the Nazis to be the most effective method to back up public morale.

From France

SOME details of aircraft in production with French firms for Germany were given in *Flight*, November 12th ("Behind the Lines"). According to reports, two more types should be noted: the Messerschmitt Me 208 and the Heinkel He 274.

The Me 208 has been in production for some time in France (*Flight*, June 4th, 1942, "Behind the Lines"). It is a low-wing monoplane developed from the Me 108 "Taifun," which was powered with an Argus inverted V engine of 240 h.p. and is used for liaison duties. A special feature of the Me 208 is the tricycle undercarriage.

While details of the Heinkel He 274 are vague and cannot be considered reliable, it is stated that the aircraft is being developed for transatlantic raiding or commercial purposes. The Heinkel He 274 is said to be a development of the little-known Heinkel He 177 and powered with four B.M.W. 802 18-cylinder twin-row air-cooled radial engines of 2,000 h.p. each. According to reports, both the arrangement of engines and the general design of the aircraft is conventional, with the exception of the landing gear: each of the inboard engine nacelles carries a complete two-wheel undercarriage, retracting laterally into the wing. The aircraft, which is apparently in the development stage, is estimated to have a weight of 40 metric tons and a speed of only 200 m.p.h. The first prototype is expected to be completed by next spring.

From Italy

ACCORDING to newly issued regulations, candidates for Officer Cadets in the Italian Air Force Reserve must be between 17 and 26 years of age, with a matriculation certificate or similar education, and must be members of the Fascist party. Selected candidates have to undergo a three-months' initial course, upon the completion of which they are graded as Cadet Officers for flying duties. After further training and a flying examination they pass out with the rank of Sergeant Major, and upon completion of another course in advanced flying they are promoted to the rank of Lieutenant of the Air Force Reserve.

Cadets who fail to qualify at the flying examination are absorbed by the administrative branch of the *Regia* or seconded to other services.

The flight engineer at the central control station on the Focke-Wulf Fw 200 "Condor."

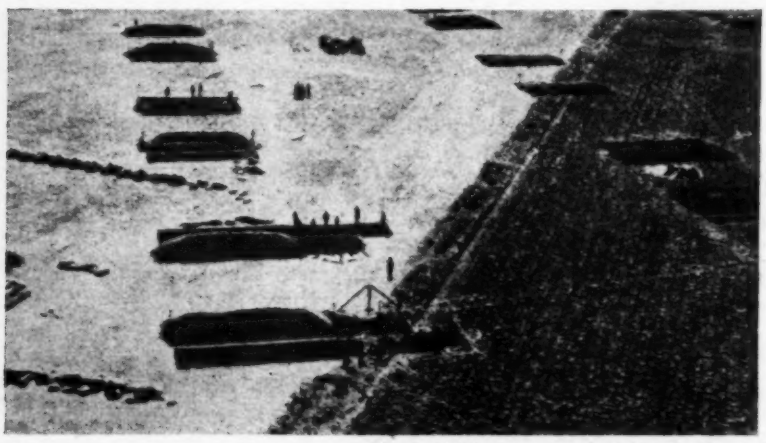
Axis Reports

THE Japanese Domei Agency has published a rather premature report of the Japanese naval and air successes since Japan's entry into the war.

While carefully omitting any reference to their own losses, the Japanese assert that, so far, they have shot down or destroyed 3,750 Allied aircraft. In the good old Axis fashion, the defeat at Guadalcanal is twisted into a success of the Japanese Naval Air Force, which is stated to have shot down 90 Allied aircraft.

A Japanese military spokesman adds to this balance sheet. According to him, 70 Allied aircraft have been shot down or destroyed since the end of October in the Chinese war zone, and 50 aircraft of the Chinese Air Force have been shot down since the end of June, and in this battle zone the military spokesman states that the Japanese lost only ten aircraft.

While it is doubtful whether the Japanese have anything to learn from the Germans in the perversion of their reports, the similarity of proportions is striking; thus the German official communiqué announced that between November 1st and 10th the Russians lost 282 aircraft against 18 German machines!



On advanced airfields, the *Luftwaffe* uses open trenches for the storage of bombs. The digging and other preparatory work is done by the R.A.D. (Labour Service Corps) units attached to the German air force.

Sensitive Dope

THE I.G. Farben are reported to have started the manufacture of new paints, the temperature of which can be determined by their change in colour. These paints, which are marketed under the name "Thermocolor," are said to be capable of indicating changes in temperature between 40 and 650 deg.; the change in colour can be observed within one or two seconds. The "Thermocolor" paints are to be used for a variety of technical purposes, among them as finish for different equipment for aircraft.

Search for Mercenaries

NAZI losses on the Russian front call for the continuous search for personnel for the different branches of service. The German-controlled Paris radio now announces that the Motorised Corps of the *Luftwaffe* is accepting in its ranks Frenchmen between 18 and 50 who "hold Nationalist views."

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AIRCRAFT TYPES AND E

DOUGLAS DAUNTLESS

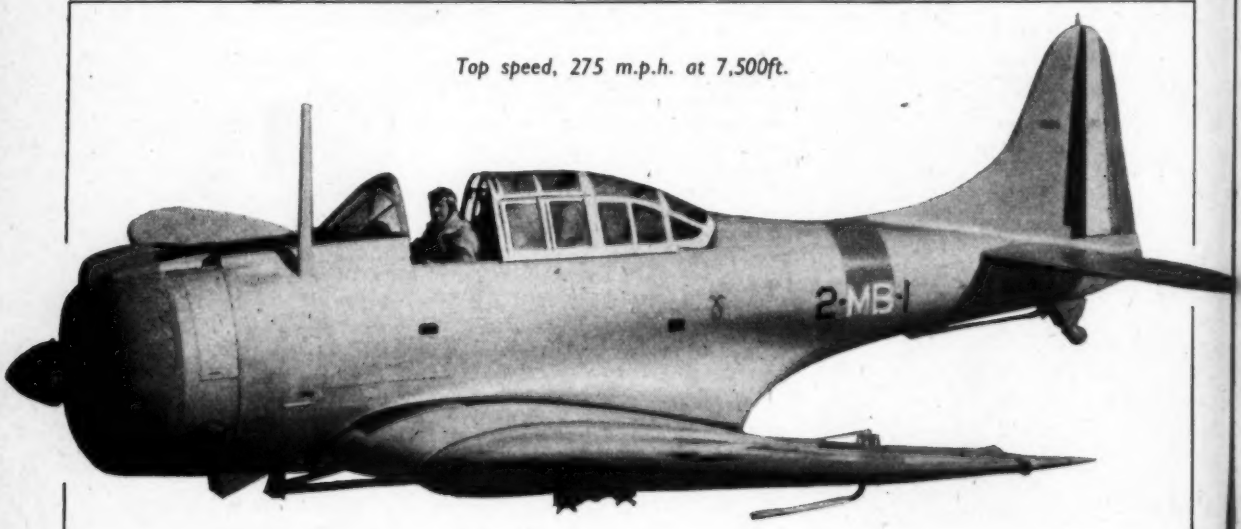
THIS aircraft, with suitable modifications mainly in the matter of its equipment, is in service with the R.A.F., the U.S. Army Air Force, to whom it is known as the A-24, and with the U.S. Navy, in whose list it bears the original designation of Douglas SBD. The latest version is the SBD-3, but the only differences between this and the two previous models are certain small detail improvements. Actually, the original SBD-1 was a development of the Northrop A-17A of the U.S. Army, which is the Nomad of the Fleet Air Arm, the R.C.A.F. and the South African Air Force.

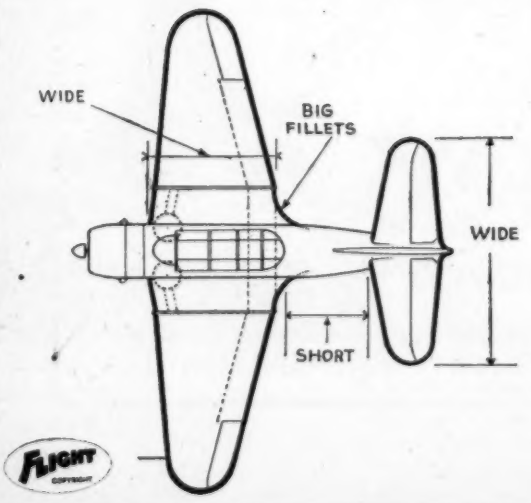
As a dive-bomber, the Dauntless has seen a great deal of service with the U.S. Navy in the Pacific, notably in the Battle of the Coral Sea and in the celebrated action off Midway Island, when it was operated from aircraft carriers.

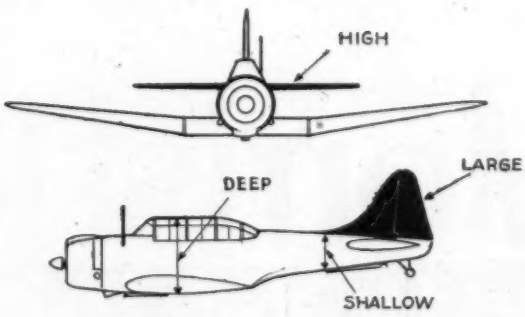
Powered by a Wright Cyclone GR-1820-32 nine-cylinder air-cooled radial engine of 950 h.p., this two-seater, low-wing cantilever monoplane is of duralumin construction throughout and has a flush-riveted, stressed-skin covering. The wings, which have a rectangular centre-section and tapering outer panels with detachable tips, are built on the multi-cellular principle, while the fuselage is an oval monocoque. Fixed slots of the "letter-box" type are incorporated in the leading-edge of the wings near the tips, and the flaps are unusual in that they are split and perforated, one half folding up and the other down to act as dive-brakes. A hook to engage the deck arrester-gear is provided under the fuselage, near the tail, on the Navy versions.

Full details of the latest armament is not at present available, but in the case of the U.S. types it is known to include two synchronised 0.50in. machine guns firing from troughs in the fuselage decking, through the airscrew disc. A 500 lb. bomb is carried in a swinging cradle beneath the centre-section, and external bomb-racks are provided under the roots of the wing outer-panels. Top speed is said to 275 m.p.h. at 7,500ft.

Top speed, 275 m.p.h. at 7,500ft.





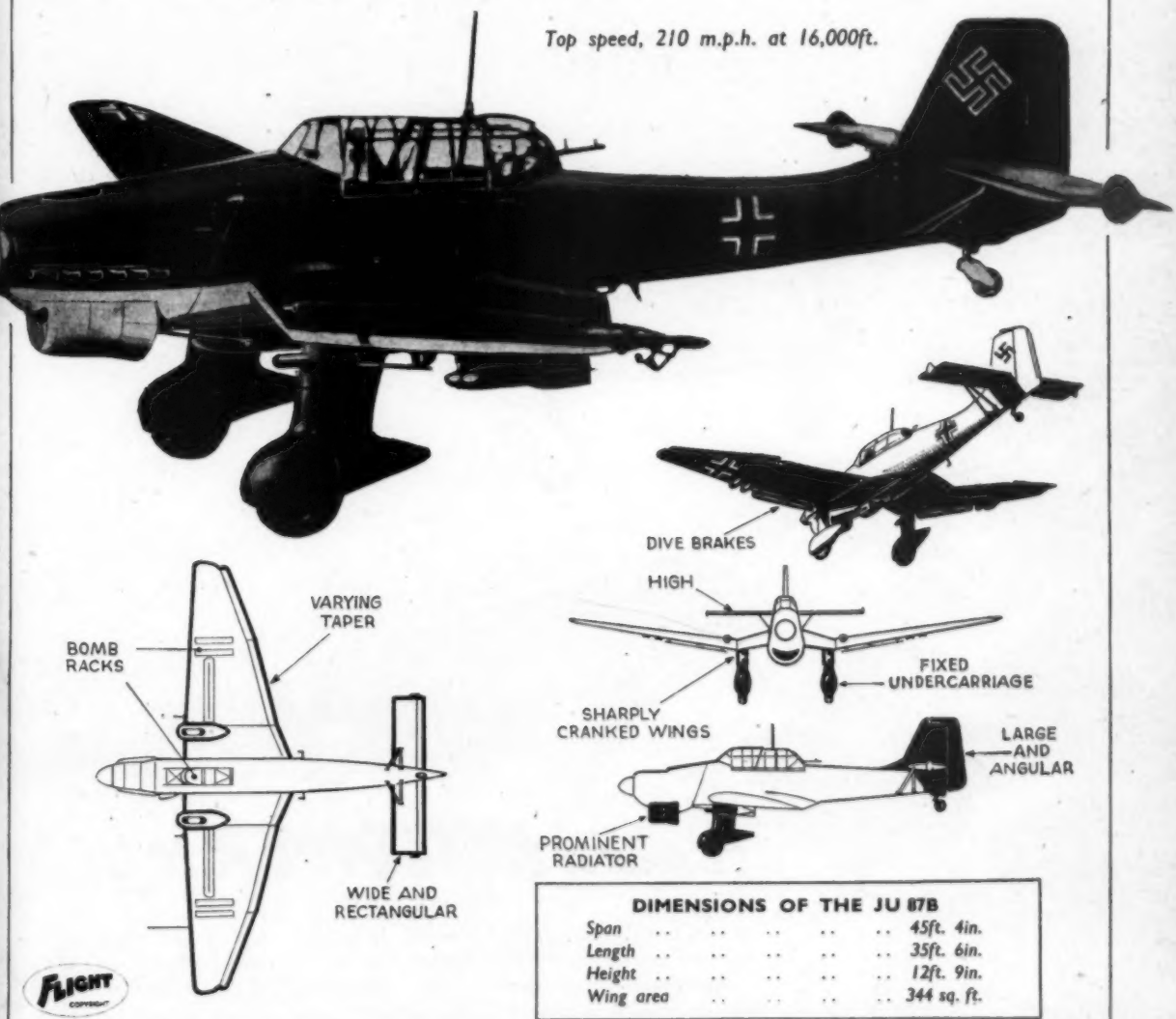


DIMENSIONS OF DAUNTLESS

Span	*41ft. 6in.*
Length	*31ft. 9in.*
Height	*13ft.*
Wing area	*Approx. 335 sq. ft.*

EIR CHARACTERISTICS

JUNKERS Ju 87B



DIMENSIONS OF THE JU 87B

Span	*45ft. 4in.*
Length	*35ft. 6in.*
Height	*12ft. 9in.*
Wing area	*344 sq. ft.*

POSSIBLY the ugliest thing that ever flew, the Junkers Ju 87B was developed towards the end of the Spanish Civil War from the prototype 87A, and became the notorious "Stuka" right from the start of the present conflict. With little or no opposition in Poland, and not much more in Norway, Holland and Belgium, it was used with such brutal ruthlessness to dive-bomb civilian refugees, as well as troops, that it earned a reputation as ugly as its appearance.

But as soon as it was faced with serious opposition it proved easy meat for R.A.F. fighter pilots, and the complete faith which the German High Command placed in their ungainly bird of prey proved to be decidedly short-sighted, for Stukas by the hundred have been shot down over France and the English Channel. This vulnerability is due partly to their low top speed of little more than 200 m.p.h., greatly aggravated by their poor armament, which consists only of two wing guns firing forwards and a single gun in the aft cockpit for defence from the rear. Incidentally, the low top speed is not so much due to any lack of power, for the Ju 87B is fitted with a 1,150 h.p. 12-cylinder inverted "V" liquid-cooled Junkers Juno 211 engine, but to the high drag. A recent and slightly less untidy version, the 87D, is a trifle faster.

Certainly, the unlovely lines of the Ju 87B are an asset where spotting is concerned, for the heavily cranked wing and the aggressive nose with its gaping radiator could hardly be mistaken. Structurally, it is an all-metal stressed-skin design with ailerons and flaps on the familiar Junker's "double-wing" principle. Its bomb load comprises either a single 1,100 lb. bomb under the fuselage, in the usual swing cradle to clear the airscrew when diving, or a 550 lb. bomb beneath the fuselage, plus two 110 lb. bombs under each wing, outboard of the dive brakes.

...and a HELLDIVER it is!

When, in 1928, Curtiss-Wright built the first carrier-based Navy airplane designed specifically for dive-bombing, its then sensational ability inspired the name, "Helldiver."
Today's Helldiver, the new SB2C-1, more than ever justifies its name—for its flashing speed and the greater destructive power of its heavier bomb load and deadlier armament have won the rating of "world's best" in the judgment of impartial authorities

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AIRPLANE DIVISION

FIRST
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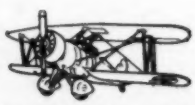
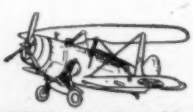
1928 • First United States Navy Airplane built specifically for dive bombing tactics and carrier operation. Two fixed guns in upper panel and a rear swiveling gun completed the armament.



1933 • Further streamlined, using a twin-row radial engine for higher performance, the now famous Curtiss Helldiver was in use by both the United States Navy and Marines.



1937 • Many squadrons of these high performance SBC-3 dive bombers with heavy defensive armament and completely retractable landing gear saw service in the United States Fleet.

1939 • The SBC-4 powered with a Wright Cyclone, superseded the earlier type and excelled in performance. Planes of this model were still being delivered to the Navy in 1940.

Fighter Armament

Part III

20 mm. Hispano cannons for the Royal Air Force awaiting inspection at one of our gun factories.

German Preference for Encased Wire Control : Electric Firing : Ducting Hot Air to Ammunition Chutes

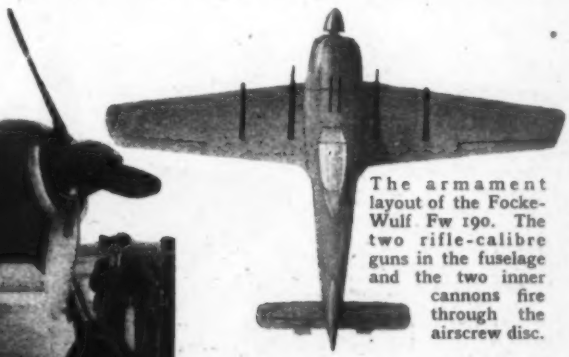
IN this, the concluding article in this series, the types of guns employed, and their installation in fighter aircraft of Germany, Italy, America, Russia, Japan and France, are described. The article concludes with a forecast of likely future developments when fighters with more powerful engines come into general service.

Concluded from page 557

Germany

FLUCTUATION of armament due to structural and tactical considerations, changes of official policy, and availability of new weapons, is particularly well demonstrated in the case of the Me 109, the most widely used German single-seater fighter. This aircraft was originally equipped with two rifle-bore (7.9 mm.) machine guns of the standard German Rheinmetall MG 17 pattern. Substitution of a 900 h.p. DB 600 engine for the 650 h.p. Jumo 210 made possible an increased armament load, and the fuselage-mounted MG 17s were supplemented by a 20 mm. high-velocity Oerlikon-type gun firing through the airscrew hub. This combination, however, did not appear to find official favour (possibly due to the introduction of twin-cannon, single-seater fighters in France), with the result that, at the beginning of the present war, the Me 109E, Germany's standard fighter of the period, carried either four MG 17s (the additional pair being mounted in the wing outboard of the airscrew arc), or, in place of the latter, two 20 mm. Oerlikon FF low-velocity shell-firing guns. These latter were also made by Rheinmetall.

It is not generally appreciated that, until the introduction into service of the Me 109F (after the battle of Britain), no Me 109s used in the present war had been armed with



The armament layout of the Focke-Wulf Fw 190. The two rifle-calibre guns in the fuselage and the two inner cannons fire through the airscrew disc.

(Left) On the Fw 190 the inner Mauser 151/20 cannons project farther from the leading-edge than the outboard Oerlikons.

FIGHTER ARMAMENT—PART III

The Me 109E has a shell-firing cannon in each wing and two 7.9 mm. machine guns in the fuselage.

On the Me 109F the two fuselage machine guns of rifle calibre are retained and a high-velocity Mauser nose cannon added in place of the wing guns.

an engine-mounted gun. The hole in the spinner, commonly considered to denote the presence of an "engine gun," was for no deadlier a purpose than to cool the engine-driven generator.

There has been much speculation as to the reason for the adoption of the present three-gun armament on the Me 109F. This consists of one 15 or 20 mm. high-velocity Mauser MG 151 firing through the airscrew hub, and two synchronised 7.9 mm. MG 17s. The most probable explanation is a tactical one. The poor manœuvrability of the Me 109 had been made painfully apparent to the Germans during the Battle of Britain. This was due, not so much to inherent handicaps in the design of the airframe as to the use of a heavier engine and military load than were originally specified, and to the unfavourable outboard situation of the wing guns and their ammunition (particularly when 20 mm. guns were used). Accordingly, in the Me 109F, the armament has been concentrated in the fuselage, and this, together with other improvements, has resulted in better powers of manœuvre.

That the present armament of the Me 109F is not, as has been suggested, considered by the Germans to be the optimum for a single-seater is indicated by the marked increase in the number of guns on the Fw 190, which will be described later. Nevertheless, the layout and other features of the Me 109F armament are of sufficient topical interest to warrant a brief description.

Mauser Cannon

The MG 151, as used to fire through the spinner, is, by general agreement, one of the most brilliantly designed aerial weapons at present in use. The 20 mm. version, designated MG 151/20, is now favoured rather than the earlier 15 mm. model. This gun is about 70 inches long and weighs about 94 lb. It is fired and cocked electrically and is fed from a disintegrating metal belt. A rate of fire of 750-800 r.p.m. is attainable. On the Me 109F, the MG 151/20 is provided with 200 rounds of ammunition, which is fed to the breech from a box in the port wing.

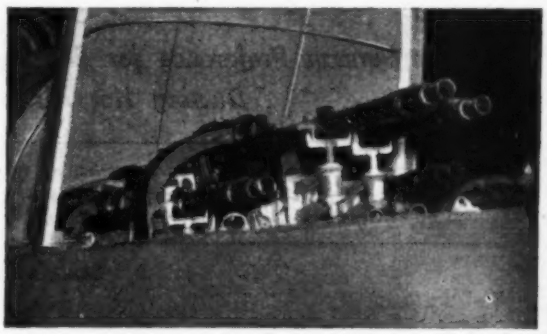
The mounting of the MG 17s differs but slightly from the Me 109E installation. As is by now well known, the MG 17 is the standard rifle-calibre fixed gun used in the German Air Force. It measures 47.7in. overall and weighs about 28 lb. The rate of fire (unsynchronised) is about 1,100 r.p.m. The system of operation is by recoil and by residual gas pressure from the muzzle blast, and the feed is by a metal belt. On the Me 109F, 500 rounds are provided for each MG 17.

The synchronising gear used is of standard German type, operated by encased "push-pull" wires. The reasons for the German preference for this gear, as given by the Heinkel concern, are not without interest.

Rigid-shaft gears were not adopted by Germany because of their weight, and because the position of the gun is determined by "the angle of deflection of the rigid shaft which the Cardan joint will permit."

Hydraulic gear, such as was used on pre-war R.A.F. fighters, is admitted to have the advantage that the location of the gun(s) is "fairly well independent of the engine," but the fact that the pressure in the hydraulic system decreases with time, necessitating renewal by hand pump during combat, is considered a very great disadvantage.

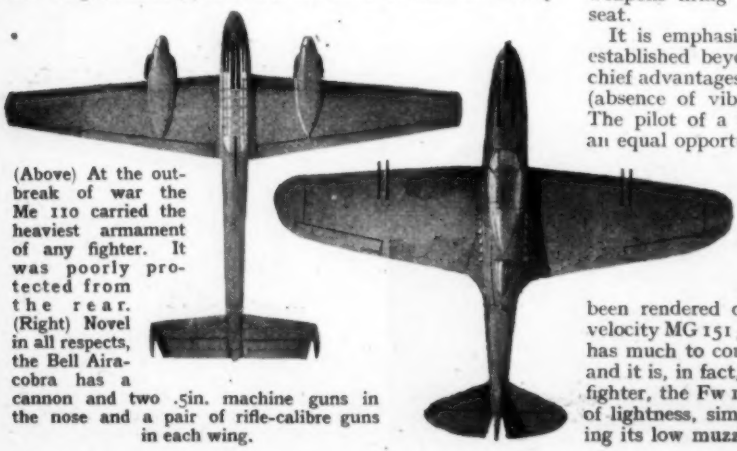
The gun installation on the Me 109F undoubtedly makes for good, accurate shooting, and may have a beneficial psychological effect on the pilot, who may feel more of a marksman, with his guns lying immediately in front of him, than does the pilot of a fighter with batteries of weapons firing from points several feet outboard of his seat.



The battery of four 7.9 mm. M.G. 17 machine guns carried in the nose of the Messerschmitt Me 110.

It is emphasised, nevertheless (and this fact has been established beyond any possible doubt), that one of the chief advantages usually claimed for fuselage-mounted guns (absence of vibration and flexing) is largely theoretical. The pilot of a Spitfire, matched against a Me 109F, has an equal opportunity to display his marksmanship, which, of course, he does, with results known to all, particularly to pilots of Me 109Fs.

The fact that the well-tried Oerlikon FF short-barrelled 20 mm. gun is not included in the armament of the Me 109F does not imply that this weapon, with its muzzle velocity of only 600 m/sec., has been rendered obsolete by the introduction of the high-velocity MG 151/20. On the contrary, the little Oerlikon still has much to commend it, particularly for wing mounting, and it is, in fact, utilised on the latest German single-seater fighter, the Fw 190. The Oerlikon FF possesses the virtues of lightness, simplicity and reliability, and, notwithstanding its low muzzle velocity, it is still a formidable weapon



(Above) At the outbreak of war the Me 110 carried the heaviest armament of any fighter. It was poorly protected from the rear. (Right) Novel in all respects, the Bell Airacobra has a cannon and two .5in. machine guns in the nose and a pair of rifle-calibre guns in each wing.

for short-range attacks. These, despite much theoretical investigation into the question of long-range firing, still predominate in modern aerial warfare.

Worthy of special mention is the principle of operation of the Oerlikon FF. The bolt is of the non-locking type (support to the base of the shell being supplied by the mass of the bolt) and the barrel does not move. In the final stage of its forward movement the bolt fires the shell; thus its kinetic energy has first to be absorbed by the explosion before a rearward acceleration can be imparted. On receding, the bolt compresses an actuating spring which, as soon as it has absorbed the recoil energy of the bolt, returns it to the forward position and fires another shell.

The armament scheme of the Focke Wulf 190 is certainly one of the most remarkable features of the well-designed Fw 190 fighter. This comprises two Oerlikon FF guns, two MG 151/20s, and two MG 17s. The MG 151/20s are, of course, the most important and formidable items. They are mounted in the wing, very close to the fuselage sides, and are particularly remarkable in that they are the first guns of their bore to be used to fire through the propeller arc. Synchronised, the rate of fire is considerably less than that of the same type of gun on the Me 109F. Two hundred rounds per gun are provided; these are carried in belt boxes in the fuselage.

MG 151 Synchronisation

The system of synchronisation used with the MG 151/20s on the Fw 190 warrants special attention. The cartridges are fired by the introduction of an electric current into their specially designed bases by a make-and-break arrangement.

Mounted slightly outboard of the undercarriage are the Oerlikon FF guns. They are provided with the conventional sixty-round drums, which are faired by bulges on the underside of the wing.

The MG 17s are installed forward of the pilot's cockpit and fire through blast channels in the top of the engine cowling. These guns are probably included mainly as "sighting" weapons. They have 1,000 rounds apiece.

It is interesting that the comparatively old MG 17 guns have been retained, as a 7.9 mm. gun with a considerably higher rate of fire (MG 81) has been in use on various types of German aircraft for a considerable time. Up to the present, however, this weapon has not been generally applied to fixed installations.

On the Fw 190, the pilot fires the guns by means of a button on the front of the control column. To the side of the column is a selector device which enables him to fire any of the following combinations:—

(1) All guns.
(2) Oerlikon FF guns.
(3) MG 17s and MG 151/20s.

Furthermore, there are cut-out switches in the cockpit which permit each pair of guns to be fired independently. As is usual on German installations, rounds counters are provided.

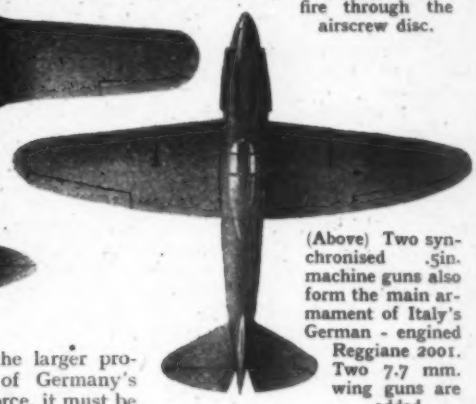
An interesting detail is the heating system for the MG 151s, whereby hot air is taken from the engine cowling and ducted to the ammunition chutes, whence it passes upwards to the breeches. Hot air is also supplied to the outboard Oerlikons, but the MG 151/20s, due to their proximity to the BMW 801 engine, do not require heating.

The standard German optical gun sight (Revi 12/d) is used on the Fw 190, and is mounted slightly to starboard of the vertical centre-line.

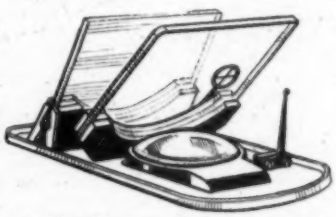
Although single-engined single-seaters represent by far the larger proportion of Germany's fighter force, it must be remembered that the multi-purpose, twin-engined two-seater Me 110 is primarily a fixed-gun aircraft, and that it has been employed tactically in the manner of a single-seater fighter. There is no question that the Me 110 is, or was at the time of its introduction, an outstanding aircraft. For attacking bombers and other aircraft larger and heavier than itself it was admirable, having the range to intercept the enemy at a considerable distance from its base, and the armament (two 20 mm. Oerlikon FF guns, four 7.9 mm. MG 17s, and one free 7.9 mm. MG 15) to achieve telling results against the comparatively lightly armoured bombers of its period. The Battle of Britain, which confirmed and disproved so many theories, showed that, despite its good handling qualities, the Me 110 was out-manœuvred by the smaller and lighter Hurricane and Spitfire, and subsequent development of the type was directed rather toward improving its value as a bomber and low-flying, ground-attack aircraft than to amelioration of its fighting qualities. The type remains, however, as a formidable night fighter, and makes an interesting comparison with our Beaufighter.

One of the most commendable features of the Me 110 is the neat installation of a group of four MG 17s in the extreme nose of the fuselage. These are staggered, and are provided with 1,000 rounds apiece, carried in belt boxes which can readily be withdrawn through the sides of the nose. Farther aft, mounted in the floor of the rear cockpit and firing through blast tubes, are the two 20 mm. Oerlikons, which are

The Italian fighters are poorly armed by modern standards. The Macchi C.200 (left) has two .5in. machine guns synchronised to fire through the airscrew disc.

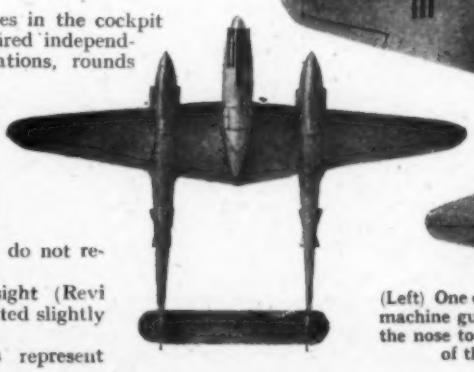


(Above) Two synchronised .5in. machine guns also form the main armament of Italy's German - engined Reggiane 2001. Two 7.7 mm. wing guns are added.



In the German reflector gun-sight the front panel of anti-dazzle tinted glass is retractable.

Always favouring the .5in. machine gun, the Americans have fitted two batteries of three each in the wings of the Kittyhawk.



(Left) One cannon, two .5in. and two .3in. machine guns are all grouped together in the nose to form the offensive armament of the Lockheed Lightning.

FIGHTER ARMAMENT—PART III

supplied with three standard sixty-round drums apiece. The drums are changed by the rear-gunner/wireless operator, who, like the pilot, is provided with rounds counters.

The armament of the Me 210 has not yet been made public, but it is reasonable to suppose that use will be made of the MG 151/20 or some gun of later and more efficient design than the Oerlikon FF.

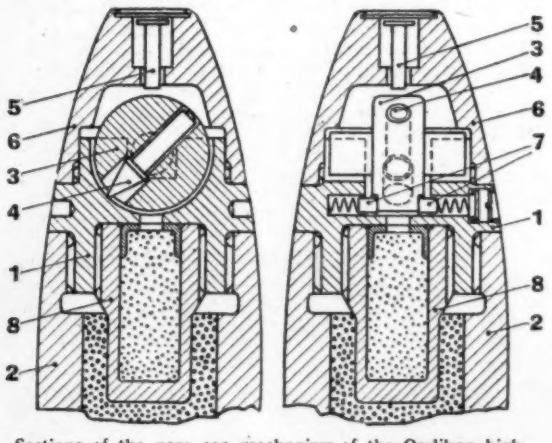
Italy

Italy was slow to abandon the Great War legacy of two synchronised guns for single-seater fighters. Reasons advanced by Italian experts for the adherence to this scheme included high accuracy of fire, due to the steadiness of the mountings, good distribution of mass (without prejudice to manœuvrability); accessibility; and the possibility of providing a larger amount of ammunition per gun than on more heavily armed aircraft. The advantages claimed have been proved to be largely theoretical, and articles in official Italian publications, which have made much of them, must be regarded as "pep talks" for Italian pilots who are still condemned to fly slow, two-gun fighters. Shortage of weapons is another possible explanation for the retention of the two-gun formula, although the newest Italian fighters are armed with four guns.

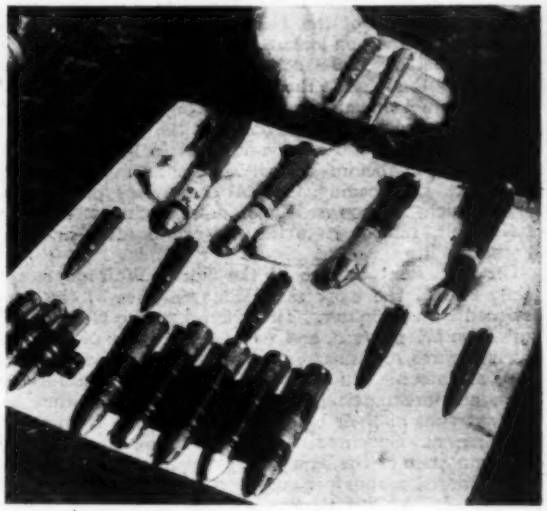
Credit is certainly due to the Italians for realising, many years ago, the potentialities of the "half-inch" (12.7 mm.) gun. Such weapons have been developed in Italy by Breda and Isotta-Fraschini (the latter under Scotti patents) since a quantity of 0.5in. Vickers was supplied to the Italian Government long before the present war. As a matter of historical interest, the 0.5in. Vickers fired a bullet weighing 565 grains at a muzzle velocity of 2,550ft./sec. The rate of fire was 300-700 rounds per minute, according to the type of ammunition.

On the well-known C.R.42 biplane fighter, examples of which have been examined in this country, a 12.7 mm. Breda-Safat gun is often mounted alongside a 7.7. mm. gun of the same make. The Macchi M.C. 200, Fiat G 50, and another version of the C.R. 42, carry two 12.7 mm. guns.

The newest Italian fighters to be introduced into service—Reggiane Re 2001 and Macchi M.C. 202—likewise mount



Sections of the nose cap mechanism of the Oerlikon high-explosive 20 mm. shell. (1) Screwed adaptor joining the nose cap and shell body. (2) Shell body. (3) Rotating half-striker pin holder. (4) Lower half-striker pin. (5) Upper half-striker pin. (6) Nose cap. (7) Spring loaded studs holding the lower half-striker pin. (8) Detonator. When fired, the spin of the shell throws the holding studs (7) outwards and the distribution of the mass of the lower half-striker pin (4) is such that this turns until the two halves of the striker pin are in line. The shell then fires on percussion.



Some ammunition. In the hand, British .303in. and Italian 7.7 mm. rounds. Next are four German 20 mm. shells; the three on the left are H.E. and the one on the right a ball shot. The third row are German 7.9 mm. rounds. In the fourth row are Italian 12.7 mm. cartridges. Left to Right: Armour piercing, explosive incendiary, tracer, armour-piercing incendiary tracer, and incendiary.

two synchronised 12.7 mm. guns; but, in addition, can be fitted with two guns of 7.7 mm. bore which fire from the wing, outboard of the airscrew arc. Similar provision was made on earlier Italian fighters, but was never generally utilised in Italy. This provision was probably made with the export market in view, as potential customers (which at one time included Great Britain) did not see eye to eye with Italian armament experts.

It is known that a few years before the war the Italian Government issued a specification for an intercepter fighter with a very high rate of climb but having only one gun (12.7 mm.).

Technically, the Breda-Safat gun, the standard fixed gun of this bore now in use in Italy, is not outstanding. It weighs about 78 lb., and is over 53in. long. The rate of fire is only about 650 rounds per minute, but some interesting types of ammunition, including explosive, have been developed.

The smaller 7.7 mm. (0.303in.) Breda-Safat gun is very similar in design, but has a rate of fire of about 800 rounds per minute, and weighs only 27 lb.

Slow Starters

It is remarkable that the Italians have not yet made use of 20 mm. guns on their fighter aircraft, but developments in this direction must be expected, particularly as various types of 20 mm. anti-aircraft and general-purpose weapons have been developed in Italy during the past few years. It must also be borne in mind that Italy has developed "moteurs canon" of her own, and that use is made of DB 601 engines, which may enable her to adopt a high-velocity gun on the lines of the German MG 151.

An Italian fixed-gun installation which merits comment, although, due to deficiencies of the airframe in which it was utilised it has achieved no success in operation, is that of three 12.7 mm. Breda-Safat guns in the nose of the Breda 88 twin-engined, fighter-attack aircraft. These guns are all offset to port, one in the side of the fuselage, one top and one bottom. The gun muzzles and part of each barrel project beyond the skin of the nose, but otherwise the installation appears to be neat.

Generally speaking, the Italians have contributed little

FIGHTER ARMAMENT—PART III

to the development of fighter armament, except their 12.7 ammunition.

U.S.A.

America has for long been famed for the quality of her firearms, and it is not surprising that some of the finest aircraft machine guns have been produced by the Colt concern. These guns are sometimes designated "Colt," but are more commonly known as Brownings, denoting the original patentee. They are produced in 0.5in. calibre as well as in rifle bore (the U.S. rifle-bore cartridge is a rimless 0.3in.), and are standardised by many countries, including Great Britain. However, after considerable research into the problems associated with aircraft guns of 20 mm. bore and over, it is noteworthy that the Americans finally adopted an Hispano type gun as their standard aircraft weapon larger than their "fifty caliber" (0.5in.).

Despite the merits of the American guns, the U.S. Army and Navy air services standardised, until the overwhelming superiority of British installations had been made clearly apparent, on the archaic formula of two synchronised guns. Like the Italians, they favoured the combination of a 0.5in. gun with one of rifle bore. Wing-mounted guns were adopted as "extras" after it had become evident to the authorities that greater fire power was essential in modern warfare.

The first step taken to increase the armament of standard U.S. single-seat "pursuit ships" was the addition of two or four wing-mounted 0.3in. Brownings to the original armament of the Curtiss and Republic types then in service. Later, the introduction of the Bell P-38 Airacobra, with its unorthodox layout, gave the Americans one of the most effectively armed fighters of its power in the world.

American 37 mm. Cannon

As supplied to the R.A.F. the Airacobra mounts a 20 mm. gun which fires through the hollow airscrew hub (the Allison engine is behind the pilot); two 0.5in. Brownings in the top fuselage cowling, firing through the airscrew arc; and four 0.3in. Brownings in the wing. In the U.S.A. a 37 mm. gun, with a reported rate of fire of 120 rounds per minute, has been fitted in place of the 20 mm. Hispano, but up to the present there have been no indications of the success or otherwise of this gun. Neither is it stated that the full armament of 0.5 and 0.3in. guns has been retained in addition to the 37 mm. weapon.

So far as is known, the present type of American 37 mm. gun, as used on the Airacobra, is a Government (Ordnance Corps) product, and is not the same pattern as the American Armament Corporation's gun of the same bore.

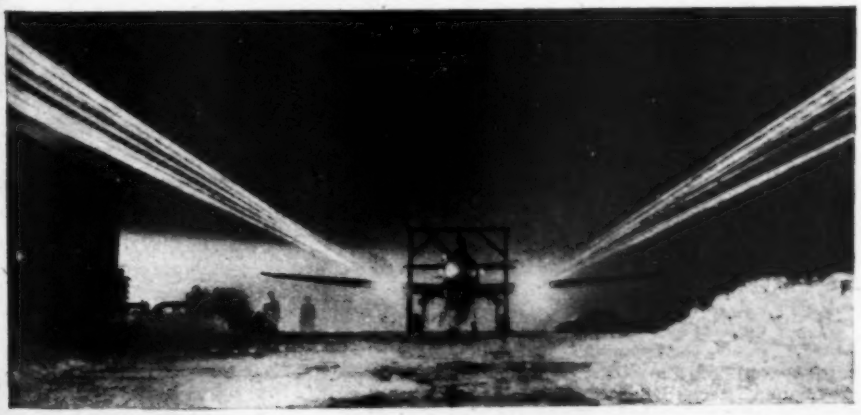
Another notable installation has been made on the Curtiss Kittyhawk. This type, a modern descendant of the earlier P-40 series, is equipped with six of the efficient 0.5in. Brownings, all of which are mounted in the wing outboard of the airscrew arc. A similar installation is evident in published photographs of the Republic Thunderbolt fighter (probably the largest and heaviest single-seater in the world); the Thunderbolt should, however, be capable of taking an even heavier armament, or, alternatively, a greater quantity of ammunition per gun, than can be stowed on the smaller Kittyhawk. Photographs of the Thunderbolt show that the guns are mounted in the wing outboard of the airscrew arc and that they are staggered, probably to facilitate feeding.

Loading the .5in. guns in the nose of a Lockheed Lightning. This particular machine appears to have three .5in. and two .3in. Brownings.

The North American Mustang, one of the most brilliantly designed fighters produced in recent years, disposes two 0.5in. Brownings under the engine cowling (mounted unusually low in the fuselage); two similar guns in the wing (unsynchronised); and four unsynchronised 0.3in. guns.

There would appear to be no reason why the current types of U.S. single-seat fighters should not be armed with 20 mm. wing-mounted guns; in fact a Curtiss Hawk, the airframe of which was similar to that of the P-40 series, was, several years ago, equipped with two 20 mm. Madsen guns.

The twin-engined, single-seater Lockheed Lightning (P-38) makes an interesting comparison with the R.A.F. Whirlwind, and embodies another interesting arma-



A Kittyhawk testing its six .5in. Brownings at night. The appearance of diverging paths is, of course, an illusion caused by the perspective of the viewpoint from which the photograph was taken.

FIGHTER ARMAMENT—PART III

ment combination. Two 0.5in. and two 0.3in. Brownings are grouped in the nose, together with one 20 mm. gun, and published photographs suggest that the installation has been well thought out.

U.S.S.R.

With characteristic reticence, the U.S.S.R. has allowed little to be published of the armament with which so much damage has been done to the *Luftwaffe*.

German descriptions of captured Russian machines show, however, that 12.7 mm. and 20 mm. guns are in use in addition to rifle-bore weapons. Other reports refer to a gun of much larger size, possibly 37 mm. Rates of fire and muzzle velocities are said to be high.

The Lagg, Mig and Yak single-seater fighters appear to be armed with one 12.7 mm. and two rifle-bore guns; or one 20 mm. and two 12.7 mm. guns. The engine mounting is favoured, and outboard installations on fighters are uncommon despite Press reports of Russian fighters with eight wing guns.

Japan

Like Italy and the U.S.A., Japan was hesitant to adopt any armament scheme to supersede twin, fuselage-mounted, synchronised guns, although experiments were made with three or four front guns, and even with fixed, rearward-firing guns, on single-seaters. Recently Japan appears to have fallen into line with 1939 German practice, and the standard Navy OO ("Zero") fighter is armed with two synchronised 7.7 mm. guns and two 20 mm. wing-mounted Oerlikons (as on the Me 109E), but no gun or installation of notable interest has come to light during the war. Certain Japanese single-seaters are said to carry a combination of 7.7 mm. and 12.7 mm. guns.

The 7.7 mm. Japanese gun, as used on fighters, is of obsolescent Vickers pattern (resembling the model used in the R.A.F. before the introduction of the Browning) and the 12.7 mm. is believed to be of Browning type.

France

To France, more than to any other country, must go the credit for fostering the development of high-velocity 20 mm. and 25 mm. aircraft guns for fighter aircraft. Several years before the present war the Hispano-Suiza concern adapted a gun of this calibre to fire through the hollow airscrew hub of a vee-twelve engine, and an installation of this type was first put into regular service in the French Air Force in the Dewoitine D.510 single-seater, an example of which was acquired for study by the British Government.

As already recorded, a 37 mm. gun was fitted to an Hispano-Suiza engine during the last war. When it was seen in France that good results could be obtained regularly with the "engine cannon," it was decided to mount two 20 mm. high-velocity guns (more powerful than the common Oerlikon FF model) in the wing of a fighter, independent of the engine, and the "pluricanon" formula was accordingly evolved.

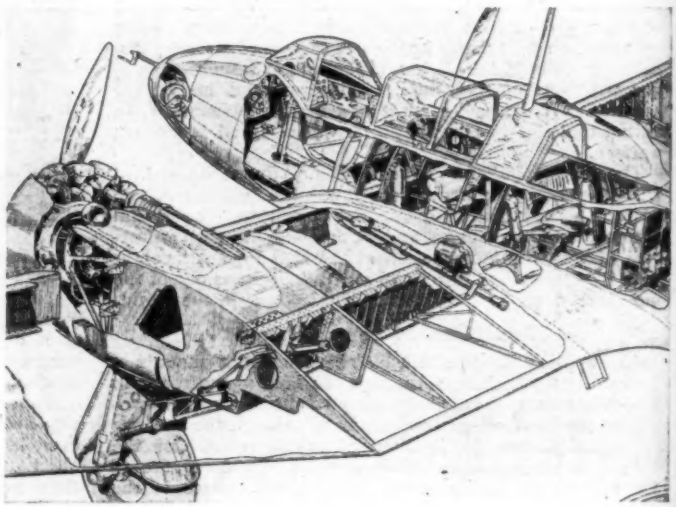
In addition to the Hispano guns, a number of 25 mm. Hotchkiss were tried out on fighters, but the Hispano was eventually standardised. It is known that an efficient 23 mm. Hispano gun was in existence at the fall of France; this was an interesting proposition in view of the fact that it was claimed that a 23 mm. explosive shell could be made to hold twice the explosive charge of a 20 mm. projectile.

The "Destroyer"

Great credit is due to the Potez concern and the French Air Ministry for evolving what might be termed the first successful "heavy" fighter, or what the Germans know as a "*zerstörer*" ("destroyer"). This was the Potez 63 which, as will be immediately apparent from a study of photographs, was almost identical in layout with the Me 110, which came at a later date. The chief feature of the Potez 63 was the installation of twin 20 mm. guns in the bottom of the fuselage (this feature was reproduced in the Me 110), and the installation, after the outbreak of war, of multiple machine guns in addition to this main armament.

Future Trends

The foregoing gives a picture of international practice in the arming of fighter aircraft since the beginning of the war; it does not, due to the reticence of the belligerent powers on prototype aircraft and their armament, provide a sure basis for a forecast of future developments. Nevertheless, it may reasonably be concluded that armament schemes as suggested below may be adopted during the next year or two:—



The layout of the Hispano cannon installation in the nose of the Potez 63.

Single-engined tractor fighters, with engines of 2,000-2,500 h.p., may be seen with any of the following combinations of guns:

Four or six 20 mm.
Eight or ten 0.5in.
Two 30 mm. or over.
Two 20 mm. plus four or six 0.5in.

Ammunition supplies will, of course, vary according to the installation, but the following will probably be minimum figures for the number of rounds per gun:

20 mm.—100 rounds.
0.5in.—300 rounds.
30 mm. or over—20 rounds.

Single-engined "pusher" fighters of the same power may be expected to carry similar armament, but the small cross-section of the nacelles of these aircraft will probably oblige designers to make use of the wing to accommodate "overflow" armament and/or ammunition.

It is improbable that twin-engined aircraft of double the power will carry twice as heavy an armament, but another 50 per cent. may reasonably be added to the above loads.

Appreciable improvements in sighting, feeding and heating arrangements must accompany the development of new types of weapons, and the destructive power of high-explosive, and/or incendiary, ammunition will doubtless be augmented.

IN PARLIAMENT

Sir Roy Fedden Accepts M.A.P. Post in America : Vital Mission Concerning Aircraft Engines : Lord Sempill Criticises Behaviour of Bristol Aeroplane Co.

THE circumstances under which Sir Roy Fedden, for so many years Chief Engineer of the Bristol Aeroplane Co., and responsible for the development of their highly successful aircraft engines, was discharged by the company, were discussed in considerable detail recently in the House of Lords.

The subject, which has aroused a great deal of speculation and comment in aviation circles, was raised by Lord Brabazon of Tara, who "moved for papers."

The noble lord said that it was a tragedy that Sir Roy Fedden had parted from the Bristol Aeroplane Company. The company was originally founded by Sir George White, who had two sisters. Never had anyone but the family and relations of it been allowed on the board. Of the present board none was an engineer. On the technical side there were two men responsible for the company's success, and one was Sir Roy Fedden. He had produced the most successful radial air-cooled engines in the world. He was responsible for more than half the power plant of the R.A.F. to-day, and had other great achievements.

Government's Request

The Government asked, as long ago as 1931, that Sir Roy Fedden be put on the board. In 1940 the Government asked if he could help the Government, but the company said his services were required by them. At the beginning of this year he was made a Knight and the trouble started about the position he should occupy in the company. He was offered the post of Technical Controller, but part of his organisation was to be controlled by the Production Manager. He could not agree and was dismissed by the company.

Lord Sempill supported Lord Brabazon in his references to the Bristol Aeroplane Company. It was, he said, regrettable that the company behaved in so cavalier a fashion to one of the greatest geniuses in aircraft design in the world, Sir Roy Fedden. Throughout the world there was a high opinion regarding Sir Roy Fedden's skill in design.

The trouble was a symptom of other troubles in the aircraft industry. Something should be done to prevent a repercussion of the same kind of difficulties in which people on the financial side made war against those on the technical side.

Lord Sherwood, Joint Parliamentary Under-Secretary of State for Air: My Lords, the matter which has been raised by Lord Brabazon is an important one, inasmuch as it deals with one of the most important parts of the defence of this country, the Royal Air Force. When the noble Lord who moved this motion left the Ministry of Aircraft Production, Colonel Llewellin, the present Minister, found that all was not right with the engine development that was going on in the Bristol Aeroplane Company.

My noble friend who moved this motion had been the Minister for some time, but when the present Minister came into office it was quite clear to him that matters had reached a stage of delay which made him bound to take an interest in a question of serious importance. In fact the Bristol Company and Sir Roy Fedden were only communicating through solicitors, and so it was clear that the Minister had to take action. Immediately this became clear to Colonel Llewellin, he sent for Sir Roy Fedden and the other parties, and tried to get them together in order to find out what was the matter and arrive, if possible, at a satisfactory arrangement. All this time engine development was suffering, and that was a matter of urgent national importance.

Parties Called Together

It was vital that something should be done. The Minister called the parties together and managed on September 3rd to get an arrangement to which all sides were agreed. Later on, however—in fact, it was the next day, I think—Sir Roy Fedden felt that he could not agree to this arrangement, although he had agreed to it at first. That was a serious matter, and I mention it to your Lordships only because the Minister had done his part in calling together the disputants in this very big matter in order to get them to agree. Letters were exchanged which proved it—I will not weary your Lordships by reading them—yet afterwards Sir Roy Fedden felt that he could not go forward. I say nothing more on that, but I wished to make the point because Lord Brabazon made this a personal attack on the family who run this business, as if they were the people who had sacked out of hand Sir Roy Fedden with no idea that there had been difficulties which other people had come in to solve, and thought they had solved, and then found a solution was not there.

As Lord Brabazon told your Lordships, there is a power which the Minister possesses in that he can appoint a controller, but of course it is only when a company is being run really inefficiently that the Minister would exercise that right. My right honourable friend would not shrink from doing this if he felt it was really necessary, but there is no evidence at all of inefficiency on the part of the Bristol Company.

Their activities can be divided into four parts—aircraft design, aircraft production, aircraft engine design and development, and development of aircraft engine production. Aircraft design is quite satisfactory, and aircraft and engine production are good. The difficulties which have arisen were entirely confined to the aircraft engine design side which was in charge of Sir Roy Fedden. That is where the difficulties, with which the Minister was faced, came from. I agree with Lord Brabazon that Sir Roy Fedden's name is associated with some of the great engines of our time—he mentioned the Jupiter, the Pegasus, the Mercury, the Taurus and the Hercules. We all know what these engines have done and how much in that connection we owe to Sir Roy Fedden.

But there is no doubt that a state of affairs had arisen which was not furthering the development of the Bristol engine. That was clear to my right honourable friend, and he had to take a decision having regard to the range of interests of the Bristol Company. My right honourable friend weighed carefully all the factors involved, and he came to the conclusion that the war effort would be best served if the connection between Sir Roy Fedden and the company were brought to an end.

Four times in his speech Lord Brabazon said that Sir Roy Fedden was "dismissed" and once he said that he was "sacked." Those are strong words to use. I have told you what Sir Roy Fedden has done, what the feeling is in the company, and what the company has to do, but there are personal sides to this matter and the Minister came to the conclusion that it would be better if Sir Roy Fedden and the company parted.

Vital Mission

How are we going to employ Sir Roy Fedden, and on what terms? Everyone agrees that the services which he can render are very great, and the Minister has offered him a position involving his going to America. It is a position connected with this most vital matter of engines and various other matters in connection with flying which are so necessary to the Minister's Department. It is indeed a post of the highest importance and Sir Roy Fedden has accepted it. Of course there have been negotiations, but I am quite certain that this job which the Minister has offered to Sir Roy Fedden and which he has accepted is one of the highest importance, and will give Sir Roy Fedden the opportunity of accomplishing even greater things than were within his scope in his former position.

Quality Counts

As Lord Brabazon has truly said, it is quality not merely quantity, nor the personalities of people, that will count in the winning of this war. The Minister has the great responsibility of seeing that these important and highly qualified people—Lord Sempill has very clearly given some indication of Sir Roy Fedden's high qualities—should be employed to the best advantage, that their services shall be utilised in the best interest of the country.

I am quite certain that what we should all wish now is not that this debate should concern itself with personalities or personal feelings, whether they be between man and man or between a company and a man, but that every man should be employed in the capacity which will enable him to give the best service.

I am certain that the arrangement which I have outlined is such that your Lordships will be satisfied that in this case that end is being attained.

HYDULIGNUM

Two-way Compression Produces Improved Material for Airscrew Blades

THERE is, of course, nothing fundamentally new in making airscrew blades of compressed impregnated wood. Large numbers of British military aircraft are fitted with such blades, and they are giving very good results in service, not to mention that their use saves a great deal of duralumin, which thus becomes available for other purposes in aircraft manufacture where it may be a better material than wood.

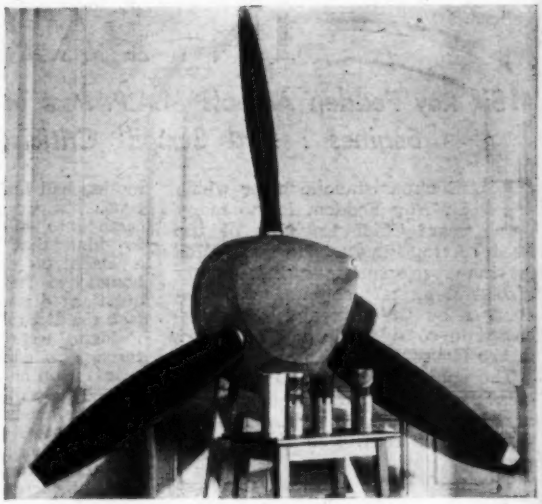
The Hordern-Richmond Aircraft Company has been experimenting for years with methods of still further improving plastic-bonded woods for airscrew blade construction. They have now evolved, not so much a new material, but rather a method of manufacture which, it is claimed, results in improved shear strength and greater homogeneity. Briefly explained, the new method is based upon compression of wood in two directions instead of in the one direction hitherto customary.

The orthodox method of making wooden airscrew blades is to coat layers of wood veneer with thermosetting resin, place them in a heated press in which the wood is compressed and the plastic softened. Upon cooling, the plastic sets and bonds the veneers together at decreased size and increased density.

Thermoplastic Resin Used

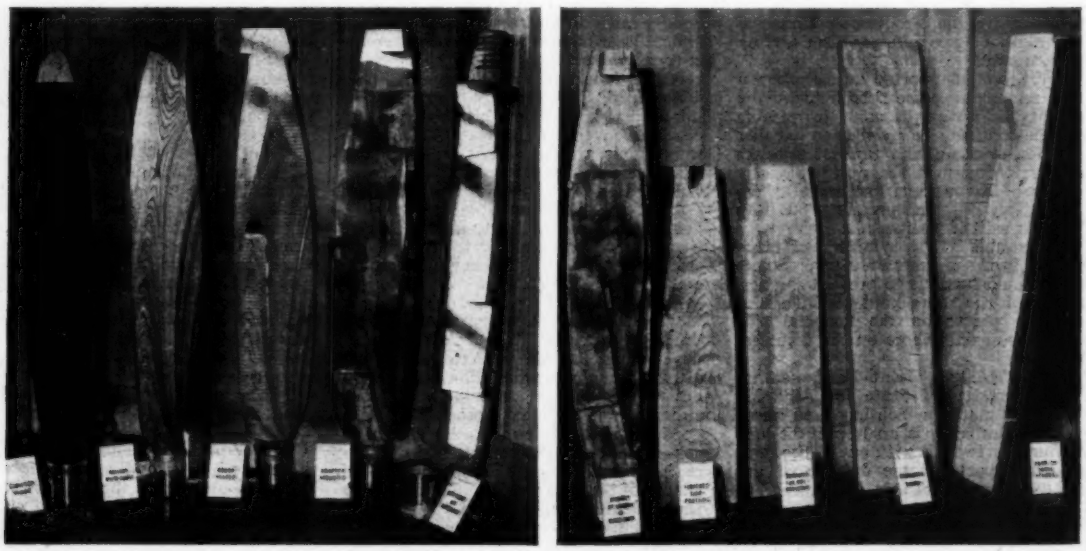
In the Hydulignum process (the name given by Hordern-Richmond Aircraft to the new method) the wood veneers are not only compressed flat-wise but also edgewise.

Obviously it would be possible to use a thermosetting resin for bonding, but that would mean that the two-way compression would have to be carried out in one operation (the expression "thermosetting" being applied to a plastic which softens on the application of heat, sets when the heat is removed, but does not soften again upon a second application of heat). For ease of manufacture, and also to give better control of density, it was preferable to compress the wood veneers in two stages; first in the normal way and afterwards edgewise. That meant that a thermoplastic resin (one which softens upon a second application of heat) had to be used instead of a thermosetting. After extensive research into various vinyl resins, Formvar was chosen as having the most suitable characteristics: high-temperature softening point, lack of brittleness at low temperatures, and great toughness and durability.

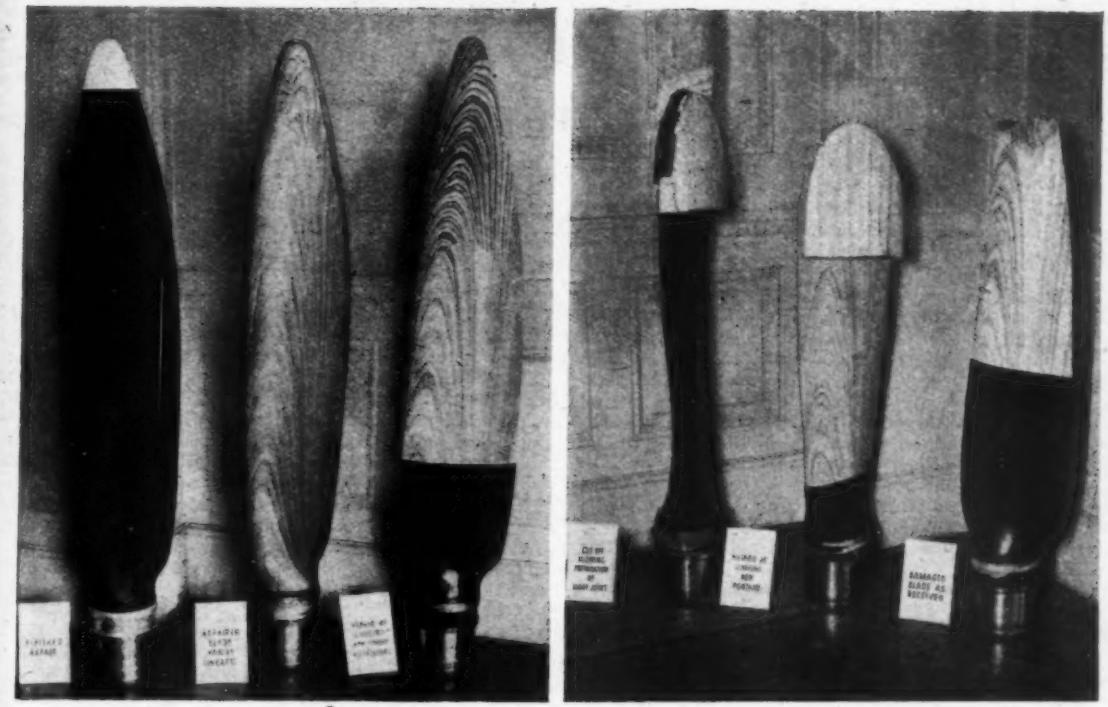


Hydulignum blades fitted into Curtiss electric airscrew hub by using original blade shanks as adaptors.

In the first operation the wood is compressed to a density of about 60 lb/cu.ft., from the original 40 lb./cu.ft. or so. It has been found that any pressure beyond this results in spreading of the veneer and consequent loss of strength. The edgewise compression is applied while the veneers are still under heat and pressure on top and bottom surfaces. By suitable choice of edgewise pressure, which is not necessarily the same as the flatwise, the density can be very accurately controlled, and a homogeneous material results. It has been found that blocks of Hydulignum can be left for almost indefinite periods without deterioration, and if, after forming the blade, any reaction should take place due to shrinkage or expansion under extreme conditions, this is equal in both directions, so that ovality is avoided.



Ten stages in the manufacture of a Hydulignum blade. From right to left: Pack of loose veneers; consolidated board; trimmed for side-pressing; finished side-pressing; assembly into glued block; butt-ended and threaded; adaptor mounted; rough-shaped; finished white-shaped; finished blade.



Repairs to a damaged Hydulignum blade. On the right is shown the blade as received, and on the extreme left the finished repaired blade.

In Hydulignum the material is, as already mentioned, compressed in two directions. By exhaustive investigations into the degree of compression in each direction, a perfect balance of shear has, it is claimed, been obtained, giving high shear values. These higher values can, of course, be used to give a stronger blade for a given root diameter, or alternatively, to retain the strength with a blade root of smaller diameter.

The need for four-bladed airscrews to absorb the power of the newer high-power engines without "going the whole hog" and using contra-rotating airscrews, has made this question of blade root diameter important, and it would appear that Hydulignum offers considerable advantages in this direction. By way of demonstrating the feasibility of making wooden airscrew blades with small roots, Hordern-Richmond Aircraft obtained some damaged blades from Curtiss hollow steel-electric airscrews. These blades have roots of very small diameter, and it had been thought almost impossible to make a wooden blade strong enough for such a small blade root. The actual steel shank was sawn off and heat-treated so that it could be pressed into a conical shape. It was then used as an adaptor into which the wooden blade root was screwed. Tests on the ground indicated adequate strength, and a complete set of blades was made and flown on an American aircraft with satisfactory results.

With the object of reducing root size to a minimum, Hordern-Richmond Aircraft have devised a very clever adaptor in the form of an internal-threaded plug screwed into the end of the airscrew blade and locked to an external sleeve of opposite thread. The shear loads are thus divided between the part of the blade root engaging with the normal external sleeve and that engaging with the inner plug, thus increasing the threaded area, and with it the shear forces which the blade is able to withstand.

There was a time when it was thought that wooden airscrew blades would be inferior, aerodynamically, by reason of the fact that the blade sections had to be thicker than those employed with metal blades. This does not apply to the high-density, compressed-wood blades, and full advantage of this fact has been taken in Hydulignum blades, which compare in aerodynamic efficiency with metal blades. The homogeneity of the material has enabled the manufacturers to shape their blade sections to the forms dictated by aerodynamic considerations, and the balancing, which is normally done by shaping the blades, is carried out in an entirely independent manner.

Here it might be explained that balancing of airscrew blades is done around two axes, one in the plane of the blades and one at right angles to this, known respectively as horizontal and vertical balancing. In the Hordern-Richmond airscrews, horizontal balancing is done by means of a weight in a bush fitting into a bore in the blade root. This bush can be threaded and used as a plug for horizontal balancing. Vertical balance is obtained in a very ingenious way by lead quadrants which can be adjusted to bring the centre of gravity of the blade into any desired position in the plane of the blade.

Our managing editor, Mr. Geoffrey Smith, discusses the merits of Hydulignum with Mr. E. Hordern (centre) of Hordern-Richmond Aircraft, and Mr. Jack Olding, who is largely interested in the company.

AIR TRANSPORT of the FUTURE

By G. GEOFFREY SMITH, M.B.E.

Development of World Airlines a National Necessity : Government Policy Awaited

IT is now clearly apparent to all who look ahead that passenger air transport all over the world on a vast scale must constitute a major post-war activity. The public, now thoroughly air-minded, is roused to that fact. It is a lament even in wartime that this country has no fleet of large air transports in being. Our negative attitude toward the development of suitable modern air transport types in recent years has been disturbing, to say the least; as a result, we have to rely upon the larger types of American aircraft for urgent transport needs, for Britain's complete energies since the war have been concentrated upon bombers and military aircraft of various types.

It is apparent that the British Commonwealth of Nations will be held together mainly by the aid of quick and efficient air transportation, which implies adequate passenger services at regular and frequent intervals over vast distances connected to a network of subsidiary airlines, and also the carriage of particular goods by air freight carriers. The necessity to shape our plans now in conjunction with suitable passenger-carrying types for war needs is pressing. Many view the problem with impatience, realising the stakes involved in the future well-being of this country.

A Government Lead is Awaited

Whether wartime necessities can be successfully blended with a solution of the post-war air transport problem is a matter for close study. Obsolescent types of aircraft will not serve their purpose in the after-war era. A large transport type of aircraft built for war requirements is capable of being transformed into a passenger-carrying type for after-war use in a comparatively short time, whereas to start *de novo* on a big passenger carrier after the war will take fully two years.

A more desirable type will, of course, emerge if the slower method is adopted, but the delay might prove disastrous. France and Germany are developing such big machines, some with six engines; and America, as we all know, has many big prototypes approaching the 100-ton mark under test and others nearing the service stage.

Britain has now in production engines developing well over 2,000 h.p. and contra-rotating airscrews are beyond the experimental stage, thus neither power unit nor airscrew is a check upon development. This country's experience, too, in the building and operation of heavy weight carrying four-engined bombers is second to none. Technical genius is available.

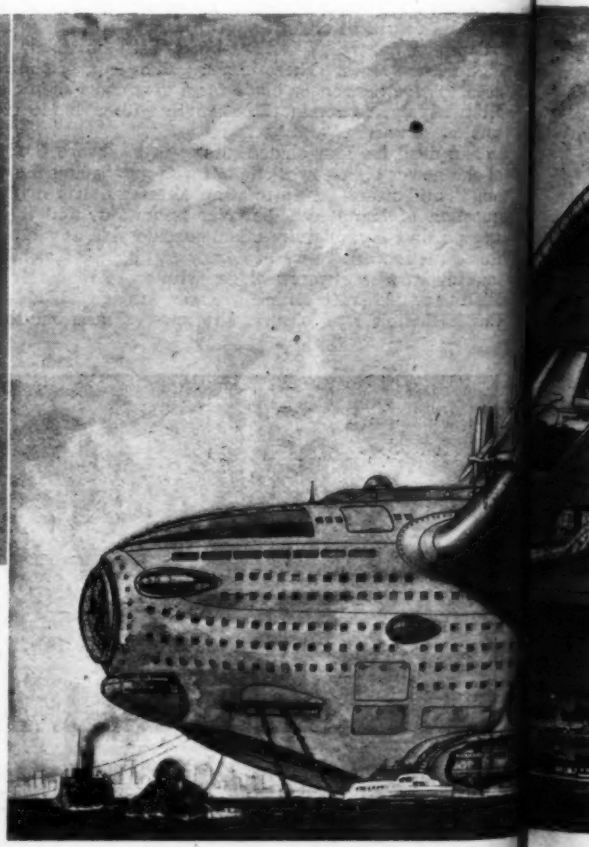
The pre-war fleet of Empire flying boats showed the way on a small scale, and but for the war the enterprise of Short Brothers, given proper encouragement, would certainly have carried on the development into bigger and bigger flying boats of greater load-carrying capacity.

The Glenn Martin *Mars* four-engined boat of over 70 tons aggregate weight is the largest known flying boat, and Mr. Martin has expressed the view that aircraft of 125 tons and anon 250 tons could now be successfully planned. Mr. H. J. Kaiser's project has aroused world-wide interest, notwithstanding so many confusing and contradictory reports, but it does appear that he is to construct three huge 200-ton experimental aircraft of steel in his shipyards in conjunction with Mr. Howard Hughes at the staggering total quoted cost of £4,500,000. This craft is to have twin hulls and seven engines.

Linking the Empire

The fact remains that there will be a vast travelling public to be served after the war. Looking east, regular services will be needed to link this country with Alexandria (and South Africa), Karachi, Bombay, Singapore, Australia and New Zealand. But that is only one of the main air routes calling for development by foresight and long-term planning

For I dipt into the Future far as human eye could see,
Saw the vision of the world and all the wonder that would be;
Saw the Heavens filled with Commerce, argosies of magic sails,
Pilots of the purple twilight dropping down with costly bales.
Tennyson, in "Locksley Hall."



WILL THE MAMMOTH AIR LINER OF THE FUTURE LOOK SOMETHING LIKE THIS? In this drawing the artist, Mr. R. E. Poulton, has given his imagination a free rein. The aircraft designer will possibly shudder, but at any rate the picture shows no lack of imagination, nor of ambition. The purpose of the small aircraft in the wing is not clear.

On the efficiency of post-war air services will also depend the extent of the transfer of passenger traffic from the far and away slower shipping routes. Thus on the development of British air routes on a vast scale, with suitable modern equipment and trained crews, will depend the proportion of air traffic which this country will share in face of international competition when the war ends. Where speed is the essence, be it passengers, mail and certain kinds of urgent goods, the efficient airline must score.

Transport is the life blood of the nation, and quick transport the imperative need for this country and its scattered Empire. The melancholy picture of pre-war activities, mainly with imported aircraft, should serve as a spur to a complete redress of the situation in regard to airlines of the post-war era. But there is no time to lose. Long-term plans should be laid now and preparations proceeded with so that this time Britain will be ready. Encouragement rather than hampering restrictions will enable air transport to be developed freely by the genius of the British aircraft industry.

A huge new civil industry is in the making. Private enterprise is capable enough and experienced enough in world transport problems to meet a call so important to our future. Monopolies tend to restrict enterprise and will not enable this country to meet successfully world competition in the new mercantile marine of the air.

The problems are so great and complex that questions of design (there is no unanimity yet on the question whether a landplane or seaplane is preferable for these large types), operational time tables, linking-up points, ground stations, and divers problems are (or should be) matters for continuous study by experts now.

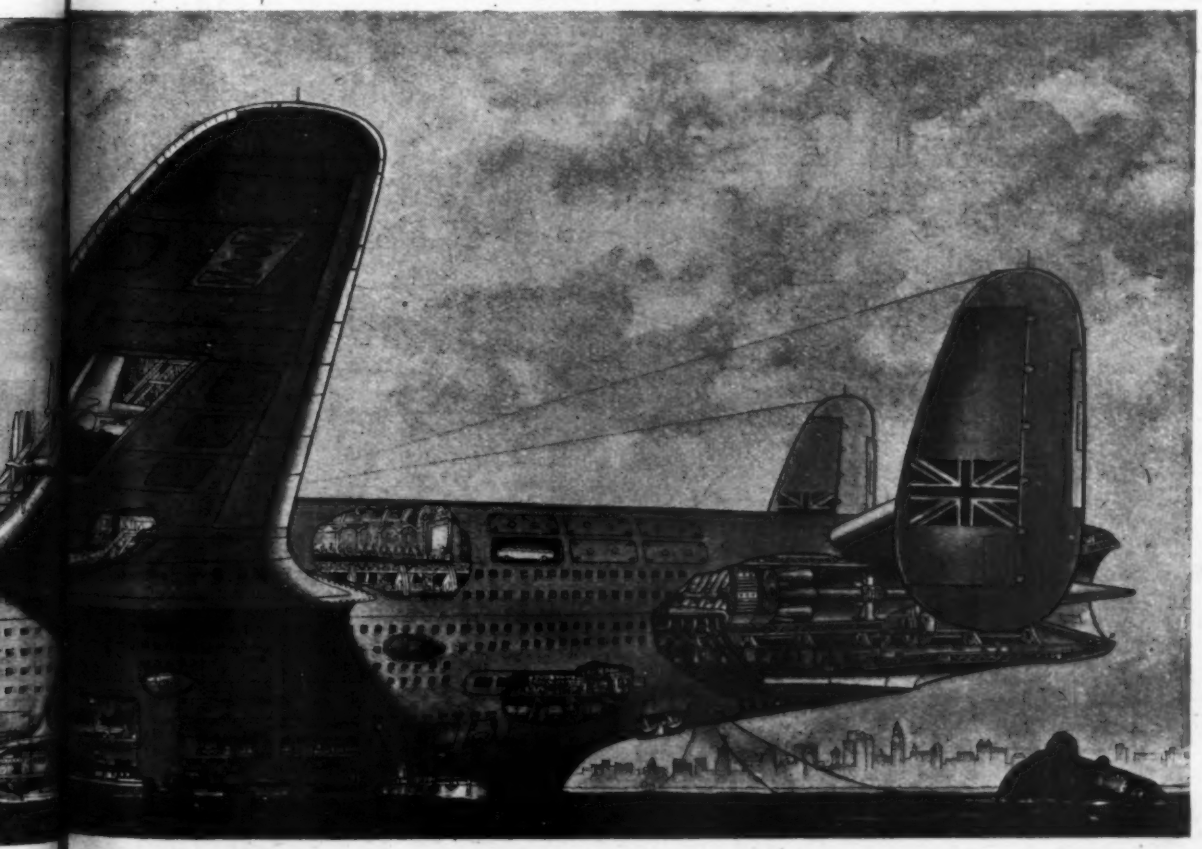
Booking accommodation weeks ahead for long-distance travel by air cannot be envisaged in the post-war era; regular and frequent daily travel facilities far and wide must be the aim. For that reason there are many who would check development of the largest sizes of aircraft and produce in their stead a correspondingly greater number of medium-sized machines. Herein operational costs enter largely into the picture.

LOOKING AHEAD

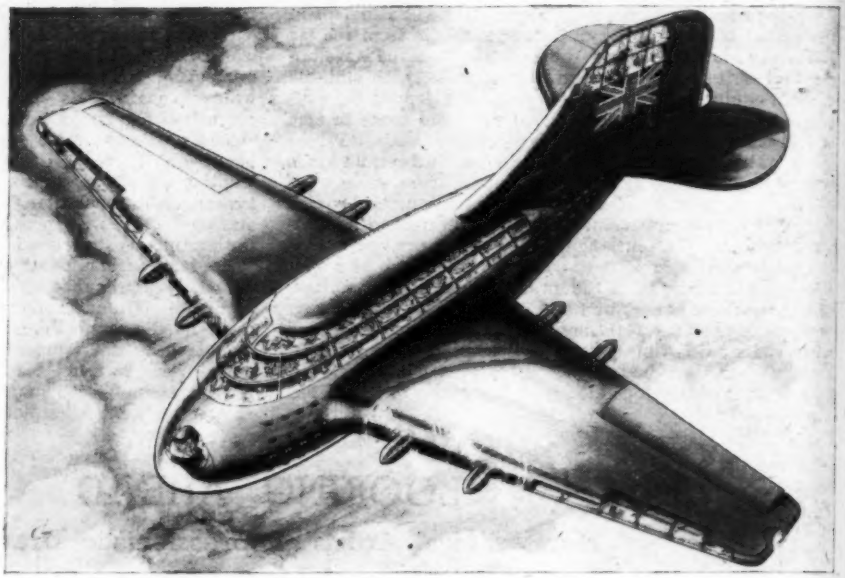
Non-technical Artists' Impressionistic Drawings

FROM time to time discussions take place in *Flight* editorial offices on possibilities in aircraft developments of the future. Occasionally artists, too, are present to indulge in such round-table talks. One day it may be that engines are the subject of discussion, another day multi-stage superchargers for new high-altitude aircraft, or helicopters, or occasionally as a change we endeavour to peep into the future and discourse upon civil types for after-war service. It was following a talk in September upon the urgent need of large passenger-carrying aircraft of the future to connect up our overseas possessions regularly and quickly, that two of our artists who had listened attentively, borne upon their keen interest in aircraft development, decided there and then to commit to paper their notions of what the mammoth air liner of the future might look like.

Their drawings of possible merchant air service types are grandiose in the extreme, but commendable and arresting, particularly as neither of them claims any special knowledge of aircraft design, or, indeed, possesses practical



LOOKING AHEAD



The shape of things to come. Last week we published a reference to the Langley monoplane of 1903. Above drawing by one of our artists, Mr. C. Langley, a namesake of the Smithsonian secretary, represents a more ambitious effort than did the Langley "aerodrome."

knowledge of operational problems connected with air liners. The artists certainly cannot be accused of failing to "think big." Nevertheless, the drawings will, I feel, be examined with keen interest by those who are interested in visualising and plotting probable types of the future. Maybe, after I had ventured that in my humble view, transport aircraft of the post-war era would be, in effect, ships with wings—that is, real air liners with promenade decks and night and day accommodation for very long-range flights, and enclosed engines to be serviced *en route*—I was taken too literally.

The drawings should be examined with a not-too critical eye, and not as the work of technicians or aircraft designers, but as extremely interesting conceptions by lay artists of mammoth types of the future. Many students of design will find dozens of features open to criticism, and interest is enhanced on that account. One drawing, by R. E. Poulton, represents, in effect, a ship that flies; the other is a mammoth landplane, by C. Langley.

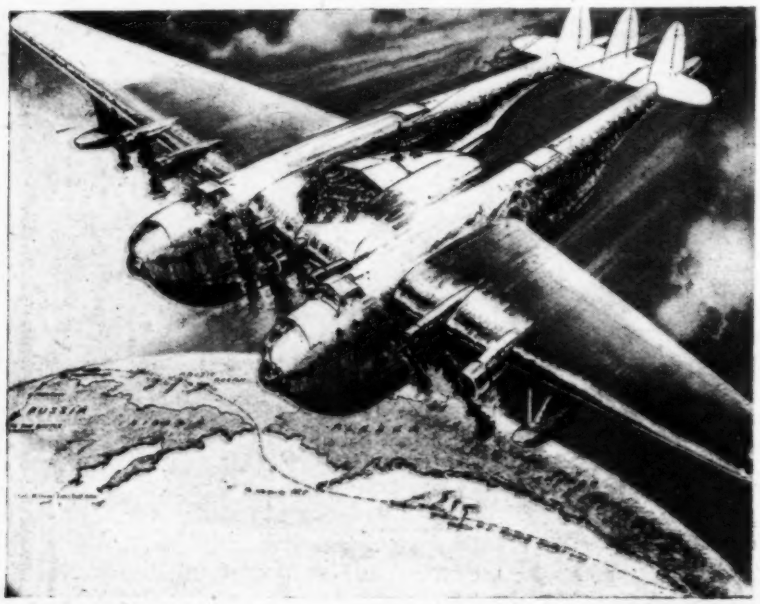
Inspired by the possibilities of jet propulsion, Mr. Poulton has embodied such a scheme in conjunction with six reciprocating engines submerged in the wings driving contra-airscrews. An amphibian aircraft is carried in the wing, for what particular purpose is not clear, but possibly for emergencies or urgent mails. Inside the hull he provides for a cinema, radio, navigators and communications room, with baggage and cargo hatches in the lower part. There is a solarium in the upper front part of the fuselage, and immediately under this a commodious control and look-out cabin; the controls, he wisely emphasises, are all power-operated. Six cabin lifeboats are provided aft of the cinema. A sponson landing stage for embarking passengers from a tender is embodied, and lifts from the sponson give access to the wings. Fuel and cargo lighters are shown alongside.

Mr. Langley's leviathan is not so presentable in appearance, nor are the lines so well balanced, but he quotes probable dimensions as length 300ft. and wing span 500ft. (Our biggest bombers are approximately 100ft. wing span.) Eight engines arranged in tandem pairs, again driving contra-rotating airscrews are preferred, the power units being buried in the wings with scaffolding to enable engineers to service them in flight.

Three covered-in decks are arranged, top sun deck, centre dining saloon, and bottom promenade deck.

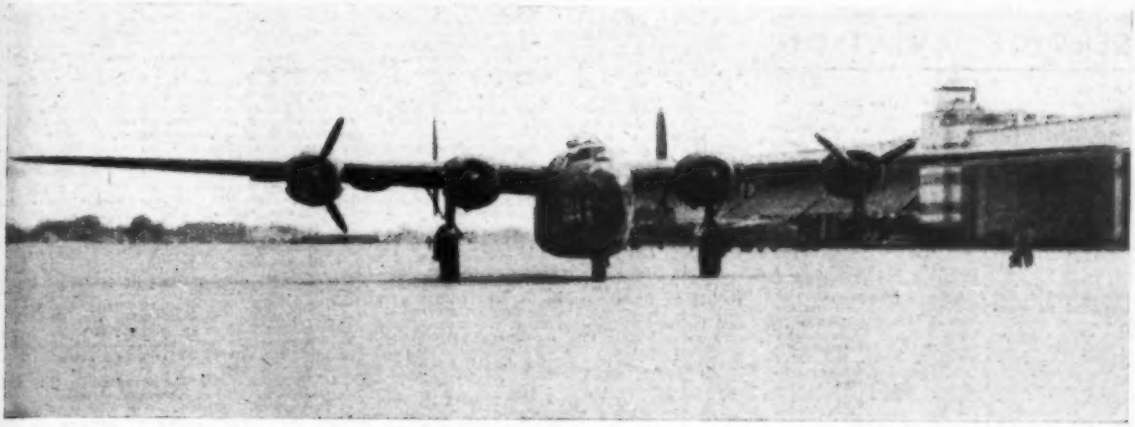
Even the single tail fin incorporates two covered-in compartments! Passengers' quarters are situated in the rear half of the aircraft, the crew in the forward half. There is also a covered-in gangway along the leading-edge of the wings, and exhaust heating pipes to prevent icing.

Mathematicians might be sufficiently interested to estimate the gross weights of each of these flights of fancy—the artists would be pleased.



An impression, by Mr. C. H. Owens, of the twin-hull design which Mr. Howard Hughes and Mr. Henry J. Kaiser are planning. With seven engines of 2,000 h.p. each, it is claimed to have a range of 2,000 miles when carrying 60 tons of freight. The need for wing floats on a twin-hull flying boat is not very obvious.

[As long ago as June 26th, 1941, we pleaded in a leader for an immediate beginning of planning our post-war civil aviation. This plea was followed by several articles and letters on the subject, of which may be mentioned "Post-war Empire Air Service," by J. W. Morrison (September 4th, 1941); "The Future of Civil Aviation," Memorandum by North-Eastern Airways, Ltd. (November 6th, 1941); and a series of articles under the same title, by "Planthair" (April 2nd, 9th, and 16th, 1942).—Ed.]



A Liberator III on the enormous concrete apron outside the Ford Company's Willow Run factory in Michigan. The factory was designed to produce one of these four-engined bombers every 60 minutes of working time.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

The London Gazette, November 13th, 1942.

GENERAL DUTIES BRANCH.

Group Captains to be Air Commodores (temp.), November 1st, 1942:—M. L. TAYLOR, A.F.C.; A. S. G. LEE, M.C.; S. P. SIMPSON, C.B.E., M.C.; P. E. MAITLAND, M.V.O., A.F.C.; A. H. WANN; F. M. F. WEST, V.C., M.C.; H. V. ROWLEY; C. B. S. SPACKMAN, D.F.C.; J. M. MASON, D.S.C., D.F.C.; A. P. LEDGER, M.B.E.; J. WHITFORD, O.B.E.; C. R. STEELE, D.F.C.; F. J. W. MELLERSH, A.F.C.; A. C. SANDERSON, C.B.E., D.F.C.; G. E. WILSON, O.B.E.; R. M. FOSTER, D.F.C.; F. L. HOPPE, A.F.C.; A. C. STEVENS; W. M. YOOL, C.B.E.

TECHNICAL BRANCH.

Group Captains to be Air Commodores (temp.), November 1st, 1942:—H. G. White; G. F. Smylie, D.S.C.; L. M. Iles, C.B.E., A.F.C.; H. I. T. Beardsworth, C.B.E.; T. A. Warne-Brown, C.B.E.; G. D. Daly, D.F.C.; O. E. Carter, A.F.C.; C. E. H. Allen, D.F.C.; C. W. Weedon; C. N. H. Bilney, O.B.E.; G. Combe.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER.

Wing Cdr. A. H. DONALDSON, D.F.C., A.F.C.—During the period October 11th to 14th, 1942, this officer participated in engagements against enemy aircraft attempting to attack Malta. Brilliantly leading his formation in attacks on bombers, regardless of the fighters which escorted them, Wing Cdr. Donaldson played a large part in the success achieved. Attacks on the island were frustrated and several enemy bombers and fighters were shot down. On October 14th he received wounds in the feet and head and two of his fingers were shot away. Despite this, he flew to base and skilfully landed his aircraft. He destroyed three enemy aircraft, bringing his victories to five.

Wing Cdr. L. C. SLEE, No. 49 Sqn.

F/O. A. S. GRANT, R.A.A.F., No. 49 Sqn.—On October 17th, 1942, Wing Cdr. Slee and F/O. Grant were captain and navigator respectively of the leading aircraft of a large force of Lancaster bombers which attacked the armament and locomotive works at Le Creusot. Much depended on their efforts, but each in his respective role displayed superb skill and determination, and a large measure of the outstanding success achieved can be attributed to their sterling work.

P/O. G. F. BEURLING, D.F.M., D.F.C., R.A.F.V.R., No. 249 Sqn.—Since being awarded the D.F.C., P/O. Beurling has destroyed a further six enemy aircraft, bringing his total victories to 28. During one sortie on October 13th, 1942, he shot down a Ju 88 and two Me 109's. The following day, in a head-on attack on enemy bombers, he destroyed one of them before he observed his leader being attacked by an enemy fighter. Although wounded, P/O. Beurling destroyed the fighter. Then, climbing again, although his aircraft was hit by enemy fire, he shot down another fighter before his own aircraft was so damaged that he was forced to abandon it. He descended safely on to the sea and was rescued.

P/O. G. F. Beurling, D.S.O., D.F.C., D.F.M. and Bar, who has done such excellent work as a fighter pilot in Malta. He was injured in an accident at Gibraltar while on his way home.

Sq. Ldr. A. D. J. LOVELL, D.F.C.—This officer is an outstanding squadron commander who has played a considerable part in the defence of Malta. One day in October, 1942, he led his squadron in an attack against six Ju. 88's escorted by a number of fighters. In the combat, Sqn. Ldr. Lovell shot down a Ju. 88, bringing his total victories to nine.

SECOND BAR TO DISTINGUISHED FLYING CROSS.

Act. Sqn. Ldr. M. M. STEPHENS, D.S.O., D.F.C., No. 229 Sqn.—From October 8th to 15th, 1942, this officer has destroyed five enemy aircraft in air combats over Malta. On one occasion he followed an enemy bomber down to sea-level, and, after pursuing it out to sea for some 20 miles, shot it down into the water. He was afterwards attacked by six enemy fighters, but he destroyed one of them and fought the others off. Although his aircraft was badly damaged he flew it to base and made a crash landing.

Act. Sqn. Ldr. A. WARBURTON, D.S.O., D.F.C., No. 69 Sqn.—This officer has completed numerous operational sorties, many of them at low altitudes and often in face of opposition from enemy fighters. In October, 1942, his gallantry was well illustrated when he directed an enemy destroyer to a dinghy in which were the crew of one of our aircraft. Although he was fired upon by the destroyer and engaged by Italian aircraft, he remained over the area until he observed that the drifting crew were picked up by the destroyer.

BAR TO DISTINGUISHED FLYING CROSS.

Act. Sqn. Ldr. E. N. WOODS, D.F.C., R.A.F.V.R., No. 249 Sqn.—In the recent heavy air fighting over Malta, this officer has led his squadron against enemy formations with great success. Between October 12th and 17th, 1942, twenty-seven aircraft were destroyed by the squadron and much of this success can be attributed to Sqn. Ldr. Woods' outstanding leadership. In one engagement, on October 13th, he shot down two enemy aircraft, bringing his victories to six.

Act. Flt. Lt. H. W. MCLEOD, D.F.C., R.C.A.F.—One day in October, 1942, this officer took part in an attack on a formation of six Ju. 88's and shot two of them down. Although his aircraft was damaged in the combat he led his section in an attack on another formation of nine enemy bombers. Afterwards he skilfully flew his damaged aircraft to base. During a period of five days, Flt. Lt. McLeod destroyed five enemy aircraft in the defence of Malta. This officer has destroyed twelve and damaged many more enemy aircraft.

DISTINGUISHED FLYING CROSS.

P/O. H. E. WINSTANLEY, R.A.A.F., No. 10 Sqn.—P/O. Winstanley has shown zeal and outstanding fortitude in his duties as an observer. In April he navigated his aircraft back to base, a distance of over 500 miles, although wounded in his right hand—an inspiring example to his comrades.

P/O. H. WALKER, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.—This officer's tenacity and fine offensive spirit, together with his matchless skill as an air-gunner, have been an inspiration to his comrades. Throughout his operational duties, he has displayed great eagerness to attack the enemy and has thereby maintained a high standard of morale in his squadron.

Act. Flt. Lt. J. V. HOPGOOD, R.A.F.V.R., No. 106 Sqn.—Flt. Lt. Hopgood has participated in a number of successful attacks on enemy and enemy occupied country. On one occasion he made a low level attack on Rostock and also bombed Warnemunde from only 2,000 feet in face of intense opposition.

P/O. T. P. SCANLAN, R.A.F.V.R., No. 218 Sqn.—P/O. Scanlan has set a high standard of navigation. On one occasion, over Bremen, he remained half an hour, despite fierce opposition, to ensure certain identification of his target.

P/O. C. E. SIMPSON, No. 10 Sqn.—On May 30th, 1942, whilst attacking Cologne, P/O. Simpson's aircraft was held by searchlights and badly damaged; one engine was put out of action and the tail gunner seriously wounded. This officer, with full knowledge of the serious difficulties his captain was in, went to the rear turret, broke the doors with an axe and administered first-aid to the gunner, afterwards proceeding to repair the wireless set.

P/O. E. A. G. UTZ, R.A.A.F., No. 12 Sqn.—P/O. Utz has displayed high courage and devotion to duty as captain of aircraft engaged on operational sorties. His determination to locate and bomb his target have been an inspiration to other personnel in his squadron.

Grp. Capt. D. I. THOMSON.—This officer has

SERVICE AVIATION

participated recently in several bombing sorties, all of which were successful. He is a most inspiring leader whose skill has contributed materially to the high standard of efficiency of the unit which he commands.

Wing Cdr. H. B. JOHNSON, No. 210 Sqn.—This officer was the second pilot of a Catalina aircraft which was attacked by a Ju 88 whilst flying in the Arctic Ocean. In the engagement, the captain was killed, but Wing Cdr. Johnson assumed control and flew the aircraft back to the coast, where he effected a safe landing in difficult circumstances.

Wing Cdr. G. M. LINDEMAN, No. 455 (R.A.A.F.) Sqn.—This officer displayed great leadership during recent operations in North Russia. The high morale of his squadron in the face of bad weather and enemy opposition can be largely attributed to this officer's fine example.

Wing Cdr. J. MCLAUGHLIN, No. 144 Sqn.—During recent operations in North Russia, this officer displayed outstanding leadership and efficiency. In the face of adverse weather and enemy opposition, his fine example inspired his fellow pilots.

Act. Sqn. Ldr. P. L. CALDWELL, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.—This officer has completed numerous operational sorties, many of them at night. Besides gaining success in defensive patrols Sqn. Ldr. Caldwell has proved himself to be a determined intruder pilot whose skill has been reflected in the work of the flight which he commands. He destroyed one enemy aircraft while engaged on defensive patrol duties.

Flt. Lt. E. A. FAIRHURST.—During operations in North Russia, this officer displayed great organising ability and leadership. His cheerful acceptance of the most hazardous tasks contributed materially to the high morale and efficiency of his unit.

Saw Five U-Boats

Flt. Lt. R. L. HANSON, R.A.F.V.R.—In September, 1942, this officer was the pilot of an aircraft detailed to undertake an anti-submarine sweep over a convoy which was being attacked by U-boats. Adverse weather prevailed, but in spite of this Flt. Lt. Hanson located the convoy and observed five U-boats, which he attacked with bombs and machine-gun fire. In his first attack, on a surfaced U-boat travelling at high speed in the wake of the convoy, Flt. Lt. Hanson achieved complete surprise and straddled it with bombs. When his bombs were all released, he continued to attack with machine-gun fire, forcing the remaining U-boats to submerge and cease their attack.

Act. Flt. Lt. A. K. S. MCCURDY, R.A.F.V.R., No. 18 Sqn.—This officer has completed a large number of sorties both by day and by night. He has displayed a high standard of operational efficiency and has always endeavoured to press home his attacks whatever the opposition. On one occasion, when detailed to attack an enemy airfield at night, he achieved much success. One bomb exploded near an enemy aircraft which had just landed.

Act. Flt. Lt. G. G. POTIER, R.A.F.V.R., No. 210 Sqn.—This officer has completed over 900 hours' operational flying. During the past two months his work has been exceptional. In operations in North Russia he completed many sorties, three of them in hazardous circumstances. On one occasion, during a convoy escort, his attacks forced two U-boats to submerge. He subsequently directed surface craft in action against them.

P/O. C. W. PALMER, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has participated in many operational missions. One night in October, 1942, he captained an aircraft detailed to attack Flensburg. In spite of intense searchlight activity over the target area, P/O. Palmer pressed home his attack from a low level. After his bombs were released he dived and enabled his gunners to machine-gun searchlights, several of which were damaged. On the return journey he flew on at a low altitude to allow his gunners to fire at a variety of ground targets.

Hit Over Dusseldorf

P/O. G. SILVA, R.A.A.F.—In July, 1942, this officer captained an aircraft detailed to attack Dusseldorf. Whilst over the target area, the aircraft was hit by anti-aircraft fire. The wireless operator was wounded and the rear turret was damaged. Despite this, the attack was pressed home and the target bombed successfully. Shortly after leaving the objective the aircraft was intercepted by an enemy fighter, fire from which caused much damage.

Act. Flt. Lt. C. R. HEWLETT, R.A.F.V.R., No. 65 Sqn.—This officer has completed a large number of sorties. In the combined operations at Dieppe, on August 19th, 1942, Flt. Lt. Hewlett flew with distinction.

Act. Flt. Lt. C. H. PARKINSON, R.A.A.F., No. 229 Sqn.—This officer is a determined fighter who has led his formation with exceptional skill. On October 17th, 1942, he shot down a Me 109. Shortly afterwards he saw, in the sea, one of his fellow-pilots who had baled out. Whilst guiding a rescue launch to the spot, his aircraft was attacked by three enemy fighters, but he drove them off. Although running short of petrol, he did not return to base until he observed that the pilot had been picked up. This officer has destroyed nine enemy aircraft.

Act. Flt. Lt. A. F. ROSCOE, R.A.F.V.R., No. 229 Sqn.—On October 12th, 1942, this officer participated in an engagement against a force of enemy fighters. During the combat one of his comrades was being attacked by a Me 109, but a burst from Flt. Lt. Roscoe's guns caused it to break away with pieces falling from it. His own aircraft was then attacked by six Me 109's. Although he was wounded in the shoulder and his aircraft was damaged, he fought his way through, and, in so doing, destroyed one of the attacking aircraft. Whilst heading for base he was again attacked. His engine caught fire, and it was only by skilful airmanship that he was able to land his aircraft. This courageous officer has completed a large number of sorties and destroyed four enemy aircraft.

F/O. J. F. MCELROY, R.C.A.F., No. 249 Sqn.—During recent air fighting over Malta this officer has displayed great courage and outstanding determination to destroy the enemy. On October 12th, 1942, during an interception, he destroyed a Me 109 and then pursued a Ju 88. Six enemy fighters were in close proximity, and F/O. McElroy turned towards them and destroyed one before they broke off the fight. Three days later his section attacked a formation of Ju 88's, and F/O. McElroy probably destroyed one of them. On another occasion, when one of his comrades was shot down into the sea, F/O. McElroy guided a rescue launch to the spot in spite of the presence of enemy fighters. This officer has completed many reconnaissances, and destroyed five enemy aircraft.

P/O. G. W. PENROSE, R.A.F.V.R., No. 12 Sqn. P/O. D. J. WHEELER, R.A.A.F., No. 12 Sqn.—As rear gunner and wireless operator/air-gunner respectively, P/Os. Penrose and Wheeler have participated in numerous bombing sorties. In August, 1942, during a sortie against Kassel, both displayed high devotion to duty in difficult circumstances. The following night they were members of the crew of an aircraft which attacked Saarbrucken. On the return flight the aircraft was intercepted by an enemy fighter. In a series of 15 attacks the bomber sustained severe damage. A shell which burst in the rear turret exploded some ammunition, and eventually rendered the turret unserviceable. In spite of this, P/O. Penrose used his guns effectively, and his fire eventually set one of the attackers' engines alight, causing it to break off the combat. Meanwhile, P/O. Wheeler, who had been wounded in both hands by shrapnel, continued his duties of fire control without mentioning his injuries. He afterwards rendered first-aid to a wounded comrade.

Act. Flt. Lt. T. H. D. DRINKWATER, No. 234 Sqn.—This officer has completed a large number of operational sorties. He is an outstanding leader, who has displayed great skill and devotion to duty.

Act. Flt. Lt. E. H. GLAZEBROOK, R.C.A.F., No. 229 Sqn.—This officer has participated in many sorties over Sicily. In the heavy air fighting over Malta, he has taken part in many interceptions and his flight has destroyed 12 enemy aircraft. He has destroyed three enemy aircraft.

Act. Flt. Lt. E. L. HETHERINGTON, R.A.F.V.R., No. 249 Sqn.—During the recent intense air activity over Malta, this officer has led his flight with great skill. Many attacks on the island have been frustrated and 18 enemy aircraft destroyed. One day in October, 1942, he led his flight in a head-on attack against a force of seven Ju. 88's escorted by a large number of fighters. A Ju. 88 was shot down by Flt. Lt. Hetherington—and two Me. 109's were destroyed. None of the bombers reached their target. This officer has destroyed two enemy aircraft.

DISTINGUISHED FLYING MEDAL.

Flt. Sgt. E. T. DAVIES, No. 150 Sqn.—As air gunner, this airman has participated in numerous sorties over enemy territory, including heavily defended targets in the Ruhr. On one occasion, when attacking Karlsruhe, his aircraft was intercepted by two enemy aircraft. In the ensuing engagement, Flt. Sgt. Davies shot one of the attackers down and assisted in the destruction of the other.

Flt. Sgt. I. R. MACLENNAN, R.C.A.F.—One day in October, 1942, this airman destroyed two of a force of 30 Ju. 88's which attempted to attack Malta. The next day he destroyed a Me. 109. He has destroyed four and damaged several more enemy aircraft.

Flt. Sgt. L. G. C. DE LARA, No. 249 Sqn.—One day in October, 1942, this airman was the pilot of one of a section of aircraft engaged on a sortie over Malta. Within a short time, two large formations of enemy bombers were intercepted. Despite heavy odds, Flt. Sgt. De Lara so skilfully led his section in attack that they caused the enemy to jettison their bombs into the sea on each occasion. He has destroyed five enemy aircraft.

Flt. Sgt. T. FLETCHER.

Sgt. L. R. HEALEY, Air/Sea Rescue Service.—In October, 1942, Flt. Sgt. Fletcher and Sgt. Healey, as pilot and air gunner of aircraft respectively flew to the assistance of one of our fighter pilots floating in his dinghy near the enemy's coast. Despite the great risk involved, as the dinghy was drifting towards a minefield, Flt. Sgt. Fletcher alighted his aircraft on the sea some 150 yards from the stranded pilot. Although heavy shelling from the enemy's shore batteries was encountered, Flt. Sgt. Fletcher taxied to the dinghy and, greatly assisted by Sgt. Healey, succeeded in rescuing the pilot. On other occasions they have been instrumental in rescuing comrades from the sea.

Sgt. B. P. SHADDICK, R.A.A.F., No. 142 Sqn.—One night in October, 1942, this airman captained an aircraft detailed to attack Cologne. On the outward flight, the aircraft was hit by anti-aircraft fire. Although the starboard fuel tank was pierced, causing much loss of petrol, Sgt. Shaddick flew on through heavy defences to his target which he bombed successfully. Whilst over the target area, the port engine was hit and ceased to function. Despite this, Sgt. Shaddick flew the aircraft back to this country on one engine and crash-landed at an airfield without injury to his crew.

H.M. the King stops to chat with the crew of "Teggie Ann" during a visit to a U.S. Army Air Corps bomber group.

Roll of Honour

Casualty Communiqué No. 175.

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. N. A. BUTT; Sgt. E. F. Chaplin; Sgt. J. M. Corcoran; Sgt. A. Grucby; Sgt. J. S. Hay; Sgt. C. J. B. Ott; Sgt. L. G. L. Owen; Sgt. S. G. Rimmer; F/O. F. Tribe; Sgt. H. Wallis; Sgt. B. J. Worsfold.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. V. Burbridge; Sgt. J. E.

Checkley; Sgt. E. Connelly; Sgt. R. H. Emery; A/C.2 H. Gorman; Sgt. J. S. Grabham; Sgt. E. Hainsworth; L.A/C. J. B. Hides; Sgt. A. A. Largent; Sgt. A. J. Nuttall; Sgt. J. T. Park; Sgt. N. C. Slee; Sgt. S. K. Stevens; Sgt. A. G. Richards; Sgt. P. Tyas; Sgt. J. R. Welsh; P/O. D. L. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. A. Acaster; Sgt. E. Anstee; Act. F/O. S. Austin, D.F.M.; W/O. G. E. A. Baxter; Flt. Sgt. C. L. Belcher; Act. Wing Cdr. J. E. D. Benham; Sgt. G. H. Bonner; Act. Flt. Lt. L. A. Brain, D.F.C.; Flt. Sgt. A. Brittain; Sgt. B. E. Brown; Flt. Sgt. M. Bunting; P/O H. Cookson; Sgt. W. W. Covey; Sgt. R. J. Cridge; Flt. Sgt. R. B. Dick; Sgt. F. Dickinson; Sgt. H. H. Fetherston; Sgt. J. D. Fleikman; Sgt. P. A. Gale; Sgt. G. Giles; Flt. Sgt. D. Gold; Sgt. B. Gray; Sgt. E. G. Green; Flt. Sgt. G. F. Gurr; Sgt. K. W. Heard; Sgt. P. W. Hine; Sgt. F. H. W. Hoadley; Sgt. T. A. Holden; Flt. Sgt. R. E. Howett; Sgt. E. Hudson; Sgt. J. Humphries; Sgt. C. J. Irwin; Sgt. Jackson; Sgt. J. Joyce; P/O. J. S. Knowles; Sgt. R. J. Ledlie; Sgt. P. J. W. Leonard; Flt. Sgt. N. McClean; Sgt. D. N. MacNab; Sgt. T. McNeill; Sgt. R. C. Mellings; Sgt. F. H. Miller; Sgt P. G. Milton; Wing Cdr. N. G. Mulholland, D.F.C.; Sgt. J. Nash; Sgt. A. W. G. Nelson; Sgt. E. W. Phillips; Sgt. D. M. Pickersgill; Sgt. T. Pierpoint; Flt. Sgt. D. C. Pollitt; Sgt. G. M. Porter; Sgt. R. C. Roberts; Sgt. G. M. Robinson; Wing Cdr. A. T. D. Sanders, D.F.C.; Sgt. G. D. Savage; Sgt. E. G. Sawdy; Sgt. F. H. Silk; Sgt. D. Smith; Sgt. D. T. Smith; Flt. Sgt. D. W. Smith; P/O. P. P. Smith; Act. F/O. W. H. Stephens; Sgt. E. Thorpe; Flt. Sgt. H. E. D. Tilby; Sgt. W. L. Taylerson; Sgt. S. A. Tyrrel; Sgt. A. C. Watt; Flt. Lt. M. O. Weizmann; Flt. Sgt. A. J. Wheeler; Sgt. H. W. Wisdom.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. R. P. Griffiths; Sgt. F. A. Rhoden.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. D. A. Morris; Sgt. W. J. Mortimer.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. P. Hind.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. E. G. Bound; Sgt. E. D. Butler; Sgt. W. A. Carruthers; Sgt. E. F. Cronk; Sgt. H. Ekin; Sgt. T. Hickman; Sgt. A. C. Jukes; Sgt. A. R. Lane; Flt. Sgt. E. G. W. Lewis; Sgt. D. McNamee; Flt. Sgt. J. A. J. Milne; Sgt. P. V. Parry; Sgt. G. Pudney; Sgt. K. R. Toller.

MISSING.—P/O. N. K. Adams; P/O. J. H. Burgess; Sgt. V. J. A. Butler; Wing Cdr. C. Charlton-Jones; Sgt. G. E. Combes; P/O. A. R. Cook; Sgt. D. B. Crabb; Sgt. G. S. D. Cumming; Sgt. A. F. P. Cursett-Sutherland; Flt. Sgt. B. J. Davis; Sgt. C. Dodds; Sgt. G. Form; Sgt. D. Foster; Sgt. J. W. Gray; Flt. Sgt. L. Grundy; Flt. Sgt. F. Hagger; Flt. Sgt. F. D. Hamilton-Wilkes; Sgt. L. Hartley; Sgt. J. V. Holland; P/O. G. C. Hooey, D.F.C.; Sgt. D. L. Howe; Sgt. D. T. Jones; Sgt. C. J. Lee; Sgt. R. H. Lucas; Sgt. J. McCleary; Sgt. R. McCulloch; P/O. A. E. Mackney; Sgt. R. C. Martin; Sgt. J. A. Mathieson; Sgt. A. Morgan; P/O. C. Neve; P/O. L. C. Newell; P/O. D. F. Nicholson; Sgt. L. N. Owen; Flt. Sgt. R. G. Page; Flt. Sgt. L. M. Peterson; Sgt. N. Podmore; F/O. D. C. Pritchard; Flt. Sgt. J. M. Rickard; Wing Cdr. G. H. Sheehan; Sgt. J. B. Shone; P/O. E. J. Smitherman; Sgt. T. W. Soper; Sgt. A. M. Temple; Sgt. A. Thomas; Sgt. J. Walker; Sgt. E. Webster; Sgt. D. T. B. Williams; Sgt. A. H. Withers; Sgt. H. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. G. Fillingham.

KILLED ON ACTIVE SERVICE.—P/O. F. G. Bamber; P/O. D. B. Bridger; Sgt. K. E. Carruthers; P/O. E. A. C. Dawkins; P/O. H. C. M. Goodwin; W/O. C .C. Hide; Sgt. R. Joyce; Sgt. J. Llewelyn; A/C.2 L. Mitchell; P/O. K. S. Oldfield; Sgt. L. G. Peacock; Sgt. R. J. Renyard; Sgt. J. B. Robertson; L.A/C. D. H. Squires; A/C.1 W. E. Taylor; P/O. H. W. Yielder.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 S. Binderman; A/C2 P. A. Boyce; A/C2 D. H. Emmett; L.A/C. W. G. Hall; A/C.2 T. Holmes; L.A/C. H. Martin; L.A/C. W. J. Morgan; A/C.1 L. A. Parkins; A/C.1 N. W. Rees; L.A/C. S. Shalloe; A/C.1 D. B. Timms; A/C.1 C. Trask.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.1 H. T. How; Flt. Sgt. E. R. Penhale; L.A/C. A. V. Smith.

DIED ON ACTIVE SERVICE.—A/C.1 J. L. Bell; A/C.2 G. J. A. Gibbons; Sqn. Ldr. L. I. Godden; A/C.2 T. Holmes; A/C.1 F. Hulme; L.A/C. F. Leonard; P/O. J. F. McKillop; A/C.2 C. F. Mole; A/C.2 W. L. Patton; A/C.1 R. Smith; A/C.1 K. C. Waite; Cpl. W. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. D. Ellis; Sgt. F. B. Leach; Flt. Lt. A. S. Malcolm.

Royal Australian Air Force

KILLED IN ACTION.—P/O. C. A. Rimmington.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. M. Herman; Sgt. J. H. Stubbs; Sgt. A. N. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. W. J. Carroll; P/O. T. M. Clark; P/O. A. H. C. Corser; P/O. F. A. Keck; F/O. J. A. McIntosh.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. Tregear.

MISSING.—P/O. E. H. Renfree.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. B. Cameron.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. R. T Bannister; Sgt. E. H. Longbottom.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. D. L. Furphy; P/O. A. B. Gutty; P/O. K. A. Murdoch; Sgt R. C. Stewart-Moore.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. F. D'A. Scott.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. L. G. Murphy; Flt. Sgt. G. M Robertson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. W. McL. Burns; P/O. R. E. Drysdale; Flt. Sgt. L. H. Jackson; Flt. Sgt. G. J. Massee; Flt. Sgt. H. A. Neal; P/O. J. W. Sills; Flt. Sgt. L. R. Sinclair.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. N. S. Ball; Flt. Sgt. J. F. Haley; Sgt. A. W. Hyson.

MISSING.—Sgt. J. Mc.K. Atkinson; P/O. L. M. Beaumont; Sgt. C. H. J. Byrd; Sgt. F. B. Croke; Sgt. L. T Goodfellow; P/O. G. C. McDonald.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. H. Bradley; P/O. W. Gilmour; P/O. D. M. Iverach; Sgt. J. Murphy.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. M. Mc.I. Stewart; Sgt. D. T. Vail; P/O. S. H. A. Wright.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. J. H. Watt.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. T. Hall.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. M. L. Berg.

MISSING.—F/O. C. D. Dobson; Flt. Sgt. N. R. Meyer.

South African Air Force

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—2/Lt. G. L. W. Gill.

MISSING.—2/Lt. W. B. Wolfe.

Casualty Communiqué No. 176.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. J. A. Collins; Flt. Sgt. M. P. S. Cummings; Flt. Sgt. G. R. Gifkins; Flt. Sgt. G. T. Relph; Flt. Sgt. E. W. Shadbolt; P/O. C. E. Stotesbury; Sgt. J. Thompson; Flt Sgt. M. J. Tomley; Sgt. N. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLD IN ACTION.—Flt. Sgt. G. J. Cheatley; Flt. Sgt. F. E. Daking; Flt. Sgt. G. M. J. Mayes; Sgt. T. Parkinson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. D. Bishop; Sgt. E. Bland; Sgt. F. H. Denton; Sgt. R. F. W. Hirst; Sgt. B. B. Jackson; Flt. Sgt. N. F. Jordan; Sgt. A. F. Muris; Sgt. J. H. F. Redhead; Flt. Sgt. P. Somers; Flt. Sgt. E. P. Walker; Flt. Sgt. S. Walker; Sgt. N. D. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. J. C. Lee; P/O. O. O. Ormrod, D.F.C.; P/O. P. A. Worth.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. P. K. J. Street; Sgt. M. E. Warburton.

WOUNDED OR INJURED IN ACTION.—Sgt. J. F. Spalding.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. J. Connon; Sgt. P. D. Keeping.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. V. Anderson; W/O. J. M. B. Black; Act. Flt. Lt. N. G. R. Booth; Sgt. J. B. Butterworth; P/O. P. W. Carr; Sgt. S. Glover; Act. Sqn. Ldr. J. C. Hall, D.F.C.; Sgt. C. M. Howard; Sgt. E. J. Ironmonger; Sgt. F. E. Lawson; Sgt. R. Maycock; Flt. Sgt. R. W. Moss; Sgt. F. A. Murphy; Sgt. R. Nicholson; Sgt. P. L. Sharp; Sgt. A. Spriggs; P/O. T. R. R. Wood.

MISSING.—P/O. J. Allen; P/O. T. Barrett; Sgt. W. Bluck; Sgt. N. Bogard; Sgt. D. W. Brett; Sgt. G. J. M. Cantwell; Sgt. S A. Carter; Sgt. L. G. Cladis; P/O. K. W. Clugston; Sgt. R. C. Cockayne; Sgt. W. J. Cole; Sgt. P. J. H. Donelan; P/O. F. H. Down; Sgt. N. J. Durkan; P/O. G. Easley; Sgt. R. Ellis; Sgt. G. Glasgow; F/O. S. Glazebrook, D.F.M.; Sgt. D. H. Glover; Sgt. W. H. Good; Sgt. J. R. Goodings; Sgt. N. P. Gregson; P/O. B. E. Grein; P/O. R. R. Hartell; Sgt. T. Henderson; Sgt. J. G. A. Hoare; F/O. R. C. Hodgson; Sgt. G. D. L. Humphreys; Act. Flt. Lt. J. J. Hurley; Sgt. H. James; Sgt. A. S. Killham; Flt. Sgt. W. E. S. Luck; Sgt. A. Marshall; Sgt. G. Maxwell; Sgt. L. W. Mears; Sgt. F. J. Millar; Sgt. W. R. Morris; Sgt. D. E. Murray; Flt. Sgt. G. Nelson; P/O. W. Nisbet; Sgt. G. A. Palmer; Sgt. J. A. Pearl; Sgt. E. R. Phillipson; P/O. R. E. S. Pink; Flt. Sgt. L. R. Pulling; Sgt. W. G. Rock; Sgt. H. Rossbottom; Sgt. H. Scarce; Sgt. G. W. Scott; Sgt. H. W. Shepherd; Sgt. L. R. Sims; Sgt. D. Smith; Sgt. J. H. Storey; Sgt. W. H. Streater; Flt. Lt. P. D. Strong; P/O. W. C. Sutton; Sgt. J. D. Swinnard; P/O. C. F. Taylor; Sgt. W. P. Taylor; F/O. J. R. Traill; Sqn. Ldr. A. C. Triptree; Sgt. J. Urwin; Flt. Lt. W. H. Wakefield; Sgt. A. A. Waldie; Sgt. J. O. Wellard; Sgt. J. H. White; Sgt. W. A. Wilson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. D. P. A. Hunt; Cpl. R. E. Springer; L.A/C. W. R. J. Stubbs.

KILLED ON ACTIVE SERVICE.—P/O. D. H. Battrick; L.A/C. G. Bradshaw; A/C.1 F. P. C. Cross; Sgt. E. H. Dawe; Sgt. E. T. A. Deacon; P/O. T. A. Dunphy; L.A/C. J. F. Eckersley; Sgt. W. L. Farrand; Act. Flt. Lt. J. R. B. Firth; Sgt. E. W. Fuidge; L.A/C. G. E. Graham; Sgt. D. H. C. Grey; P/O. F. G. Harding; Flt. Lt. M. H. Holder; P/O. G. M. Jordan; P/O. J. F. Kelly; P/O. J. F. Mackie; P/O. J. A. Manson; P/O. N. H. Moxey; Sgt. J. Mullins; P/O. K. J. Pierpoint; L.A/C. F. Schumann; Sgt. H. D. Searle; Sgt. D. A. Wapshott; Sgt. E. H. E. Welby; W/O. C. E. Wordsworth.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. R. B. Duncombe; L.A/C. L. Riches.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. A. Edgley; L.A/C. N. W. Weston.

DIED ON ACTIVE SERVICE.—L.A/C. R. S. Bailey; A/C.1 K. A. Brunsden; Flt. Sgt. R. Cockcroft; A/C.1 F. I. Court; Cpl. W. H. Grubham; A/C.1 K. G. Levett; Cpl. Cadet H. A. Moore; Act. Flt. Lt. F. A. Reis; Cpl. E. N. Toby; Sqn. Ldr. T. J. West, M.C.; A/C.2 G. A. White; L.A/C. F. Williams; Cpl. H. J. Yates.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED PRISONER OF WAR.—Sgt. G. E. Attenborough; Sgt. W. Bell; Sgt. A. Charlton; P/O. R. A. Malcolm.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. C. Gissing; Sgt. T. Gregg; Sgt. A. E. Hall; P/O. P. W. Hoad; Flt. Lt. D. T. M. Lumsden; Flt. Lt. G. H. Porter; P/O. R. K. Wilson.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. S. M. C. Brooke-Alder; A/CW.2 G. D Marr; A/CW.1 M. S. G. Mungo.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. J. Fuller; P/O. T. E. Roberts; P/O. J. E. F. Stanfield; Sgt. E. H. Thompson.

MISSING, BELIEVED KILLED IN ACTION.—P/O. W. B. Shearer.

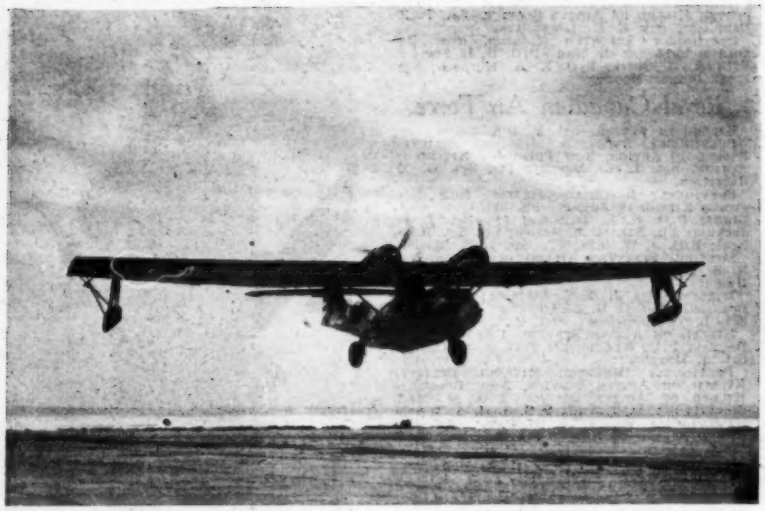
MISSING.—Sgt. T. W. S Addison; Sgt. L. Camble; Sgt. H. M. Carter; P/O. W. A. Clegg; Sgt. G. W. S. Crompton; P/O. C. J. Dumas; P/O. T. J. Forsyth; St. C. G. Fort; Sgt. R. P. Godfrey; Sgt. D. Gray; Sgt. A. Holland; Sgt. K. E. Humphries; Flt. Sgt. M. McK. Leslie; Sgt. J. Lewis; Sgt. G. B. McCloy; Sgt. L. K. McMichael; Sgt. H. J. Mayne; Sgt. C. W. Musto; Sgt. C. W. S. Oliver; Sgt. R. D. Smith; Sgt. W. L. Staines.

KILLED ON ACTIVE SERVICE.—P/O. E. V. Roy.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. T. B. Hopkins; Sgt. P. C. Walsh.

Sir Arthur Barratt, K.C.B., C.M.G., M.C. (A.O.C.-in-C. Army Co-operation Command), about to enter the Hurricane in which he frequently visits stations in his command.



More co-operation. Cansos squadrons of the U.S. Navy are working with Coastal Command on anti-submarine patrols from Iceland.

SERVICE AVIATION

WOUNDED OR INJURED IN ACTION.—Sgt. G. A. Littlejohn.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. P. Ryan.

MISSING.—P/O. M. G. Abey; Sgt. M. W. Atkins; Sgt. S. L. G. Buchanan; Act. Flt. Lt. J. S. Coulter; Sgt. G. E. Ford; Sgt. W. M. Gartside; Sgt. W. G. Gittings; Sgt. R. Greene; Sgt. J. Hannaby; Flt. Sgt. A. G. Johnston; Flt. Sgt. A. C. Kelly; Sgt. H. L. Laxdal; Sgt. J. M. Lowe; Sgt. A. E. McIlveen; Sgt. J. R. Metivier; Sgt. D. J. Navin; Sgt. C. O. O'Brien; P/O. R. S. Patterson; Sgt. A. C. Porter; P/O. P. J. C. Savage; Sgt. G. F. Smith; F/O. J. G. Speir; Flt. Sgt. E. P. Sutherland; Sgt. W. G. Webb.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. A. W. Lufergey.

KILLED ON ACTIVE SERVICE.—P/O. E. F. Bent; P/O. R. P. Fahini; Sgt. J. E. M. Lamb; Sgt. J. K. N. MacMillan; Sgt. J. D. Purcell; Sgt. D. G. Taylor; Sgt. W. M. Vacheresse; P/O. P. H. Wyman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. W. S. Brown.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. W. F. Budge

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. P. Lund.

MISSING.—Sgt. J. W. Badley; Flt. Sgt. R. W. Caskey; Sgt. L. R. Frampton; Flt. Sgt. A. G. Johns; Sgt. G. A. Jones; Sgt. M. Kraljevich; Sgt. R. Riddell; Sgt. L. I. Stewart; Sgt. N. C. Wollcock.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. B. L. Garlick.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. E. Johnstone.

South African Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Air Sgt. B. M. Gerrand; 2/Lt. J. E. M. Goodwin; Air Sgt. H. J. Ossthuizen.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Capt. J. A. Koz; Capt. A. Masson; 2/Lt. A. A. L. Tatham; Lt. A. A. Tennant; Lt. J. B. White.

Casualty Communiqué No. 177.

Royal Air Force

KILLED IN ACTION.—Sgt. C. Atkinson; F/O. T. H. W. Baker; P/O. G. S. Bishop; Flt. Sgt. A. N. Charlton; Sgt. H. Clay; Sgt. W. Green; Act. Sqn. Ldr. R. E. Kimber; Flt. Sgt. S. Martin. F/O. D. A. Pebworth; Sgt. R. L. Raphael; Sgt. K. P. Smith; Flt. Lt. J. D. Willis.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. C. Atkinson; Sgt. B. Bowring; Sgt. H. Brown; P/O. D. J. Clement; P/O. G. T. Ellis; Sgt. J. R. Fenwick; Sgt. A. G. Gooch; Act. Flt. Lt. J. H. Higgleton; Sgt. R. C. Hook; Sgt. F. R. Isaacs; Sgt. V. T. Lewis; Flt. Sgt. W. B. Lowe; Sgt. W. B. Moffatt; P/O. K. J. E. Smethurst; Flt. Sgt. A. Stirrup; Sgt. P. W. L. Strachan.

WOUNDED OR INJURED IN ACTION.—Sgt. J. A. Hall; Sgt. D. D. Morrison; P/O. I. M. Mundy; P/O. F. J. Starkie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. L. J. Barnes; P/O. E. J. Lambarth; Flt. Lt. O. G. E. McWilliam; Sgt. W. Storey.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. J. Blackmore; Sgt. F. V. Harker; Sgt. R. Helyar; Sgt. H. D. Hurst; Sgt. R. T. Jeans; Sgt. K. McAusland; Sgt. T. Shoesmith; P/O. N. Spark; Flt. Sgt. E. L. Styles; Sgt. A. F. C. Wise.

MISSING.—Sgt. M. A. Barrett; Sqn. Ldr. J. Beavis; Sgt. H. Buchan; Sgt. G. F. Bush; Sgt. E. C. Cohen; Sgt. G. W. Davies; F/O. J. T. Dick, D.F.C.; P/O. R. C. Embelin; Sgt. T. Fitzpatrick; Sgt. J. Fleetwood-May; Sgt. D. W. Fry; Sgt. R. Gemmel-Smith; Sgt. A. S. Graeme-Cook; Sgt. H. A. L. Green; Sgt. E. C. Gregory; Sgt. W. T. G. Hall; P/O. R. B. Harris; Sgt. J. Harrison; Flt. Sgt. K. J. O. Hawkins; Sgt. M. J. Hisley; Sgt. R. W. E. Holmes; Sgt. R. S. Hughes; Flt. Sgt. H. S. Impett; Sgt. R. T. Jones; Sgt. B. Kaye; Sgt. L. Kelly; Sgt. P. R. Kenny; Flt. Sgt. J. Kirkwood; Sgt. L. Lobb; Sgt. H. S. McCartney; Sgt. R. G. Miller; Sgt. S. Obbard; Act. Sgt. J. Peart; Sgt. G. J. Phillips; Sgt. H. Price; Sgt. T. H. G. Robinson; Sgt. P. H. Shulver; Sgt. J. W. Southgate; Sgt. J. Stewart; Sgt. J. H. Taylor; Sgt. F. N. Thomasson; Sgt. P. W. Tucker-Feltham; Sgt. V. H. Twining; Sgt. R. Vernon; Sgt. E. R. Williams; Sgt. D. C. Willis; Sgt. D. J. Jones.

KILLED ON ACTIVE SERVICE.—Sgt. P. Allen; A/C.2 D. F. Armstrong; Sgt. J. M. Barrell; Flt. Sgt. A. L. Brooke; L.A/C. A. Brown; L.A/C. H. A. Burman; Sgt. F. T. G. Cannon; Sgt. R. J. Coomba; Sgt. G. C. C. Davis; P/O. M. Dunn; P/O. N. Falkinder; A/C.2 R. F. Fisher; Sgt. W. H. Frank; Sgt. D. Greet; L.A/C. H. H. Hacksley; L.A/C. D. A. Harfield; Flt. Sgt. J. L. Hicks; A/C.1 R. Ibbetson; A/C.2 W. Inglis; P/O. G. C. V. Jamieson; Sgt. R. F. Kent; Wing Cdr. E. V. Knowles, D.F.C.; L.A/C. M. Mermelstein; A/C.1 H. G. Mullen; A/C.2 R. F. G. Padfield; P/O. A. B. Paton; Flt. Sgt. H. L. Pendal; P/O. G. W. Percival; Sgt. A. Perrett; P/O. M. R. Piper; P/O. G. J. Rix; Wing Cdr. S. H. Skinner; Sgt. B. A. Smith; A/C.1 A. Smyth; Sgt. T. A. Tate; P/O. A. S. Walmsley; Sgt. A. J. Ward; P/O. W. A. Ward; Sgt. G. W. West; P/O. J. Woods.

PREVIOUSLY REPORTED WOUNDED OR INJURED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. A. S. Milton.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 S. Arthurs; Air Cmdre. W. J. Crisham; P/O. J. E. Gardener; A/C.1 R. M. Hudson; L.A/C. C. Kraft; L.A/C. F. L. Mitchell; L.A/C. H. O'Callaghan; Sgt. J. F. R. Parker; L.A/C. R. Perks; F/O. C. K. Robinson; Sgt. G. F. Smith; L.A/C. W. B. Snape; Flt. Sgt. T. A. E. Tobias.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. A. Henderson; P/O. P. S. Rivington; W/O. R. T. E. Saunders; L.A/C. R. W. White.

DIED ON ACTIVE SERVICE.—Sqn. Ldr. J. C. Blyth; Sgt. E. J. Box; P/O. J. R. Dudley, D.F.C.; L.A/C. R. C. Foot; L.A/C. H. J. Hodgson; Sgt. L. F. Jones; A/C.1 G. W. Mason; A/C.1 L. Nettle; Cpl. D. O'Shea; L.A/C. R. W. Penrose; L.A/C. B. Rawlinson; A/C.1 A. D. Robbins; Sgt. L. H. Rogers; A/C.1 E. Round; Cpl. R. W. Scott; A/C.1 F. C. White; P/O. I. W. H. T. Whiteside; Flt. Sgt. F. Williams.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 D. W. Oliver.

Royal Australian Air Force

KILLED IN ACTION.—P/O. J. A. Trotter.

WOUNDED OR INJURED IN ACTION.—Sgt. J. G. Emery.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. D. Luedeke; Sgt. C. H. R. McKee; Sgt. O. Morgan.

MISSING.—Sgt. I. A. Baines; Sgt. J. W. Benn; P/O. W. D. Bohl; Sgt. J. C. Daley; P/O. W. Gengos; Sgt. M. D. Hart; Flt. Sgt. G. H. Higgins; Sgt. R. G. L. Holton; Sgt. E. A. Martin; P/O. A. F. R. Nash; Sgt. P. O'Connell; Sgt. J. D. O'Halloran; Sgt. A. L. Opas; Sgt. S. A. Shailer; Sgt. H. C. A. Warr; Sgt. D. M. Watts.

KILLED ON ACTIVE SERVICE.—Sgt. D. W. Jennings; Sgt. F. H. Rathjen.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. M. J. Mahady.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. D. McL. Leitch; P/O. E. P. Wynn.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. S. D. Dean.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. A. A. Bussell; Sgt. W. Pitch; Flt. Sgt. J. A. Foster; Flt. Sgt. W. M. Fraser.

WOUNDED OR INJURED IN ACTION.—Sgt. J. D. Douglas; Flt. Sgt. E. A. Greenwood; Flt. Sgt. C. A. Warfield.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. T. Gammon; P/O. C. S. Lenover; Sgt. J. A. Mitchell; P/O. J. F. Myrick; P/O. J. L. Sturgess.

MISSING.—Sgt. G. T. Bloomer; Sgt. B. Carroll; P/O. W. V. Clarke; P/O. A. Cook; Sgt. W. V. Donahue; P/O. J. G. Durkin; Sgt. A. L. Ellis; P/O. C. W. Harp; Sgt. E. J. Jones; Sgt. C. F. Lloyd; P/O. H. G. Locke; P/O. D. G. McLean; Sgt. A. B. Martin; Sgt. P. Prime; P/O. R. C. Prince; Flt. Sgt. J. L. Roach; Sgt. M. F. Robbins; P/O. C. L. Szumlinski; Sgt. J. Tait; P/O. F. J. Taylor; P/O. R. E. Vaupel; Sgt. E. B. Willoughby.

KILLED ON ACTIVE SERVICE.—P/O. J. S. Haynes; Sgt. J. H. Kelly; Flt. Sgt. J. J. Major; Sgt. W. H. Terwilliger.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. D. A. Hall.

Royal New Zealand Air Force

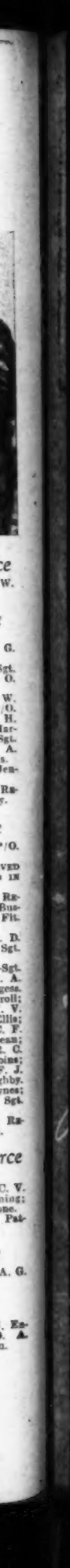
KILLED IN ACTION.—P/O. L. J. Waters.

MISSING.—Sgt. G. E. F. Bradey; Flt. Sgt. C. V. Green; Sgt. C. L. Kelly; Sgt. J. C. E. Leaning; Sgt. A. M. McPherson; Flt. Sgt. R. F. Stone.

KILLED ON ACTIVE SERVICE.—Sgt. R. W. Patrick; Sgt. J. B. Wood.

South African Air Force

WOUNDED OR INJURED IN ACTION.—2/Lt. A. G. Turner.

Indian Air Force

KILLED ON ACTIVE SERVICE.—A/C.2 H. J. Ekkatarman Rao; P/O. K. Naaman; P/O. A. Nasiruddin Aanmad; P/O. P. C. Patwardhan.